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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 12, NUMBER 5
MARCH 1, 1979

W79-02001—W79-02500

The Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

SUPERCOOLING OF WATER TO -92 DEGREES C UNDER PRESSURE,
Purdue Univ., Lafayette, IN. Dept. of Chemistry.
For primary bibliographic entry see Field 2C.
W79-02494

1B. Aqueous Solutions and Suspensions

ION MOBILITIES IN PURE WATER VAPOUR AT SATURATION,
Missouri Univ.-St Louis. Dept. of Physics.
B. L. Henson.
Journal of Physics D. Applied Physics, Vol 11 p 1405-1411, 1978. 3 fig, 25 ref. OWRT A-047-MO(2), 14-31-0001-3525.

Descriptors: Conductivity, Trace ionic impurities, Electroanalysis, Time-of-flight techniques, *Ion transport, *Water vapor, *Electrochemistry, *Thermal dissociation.

Positive and negative charge carrier mobilities in pure water vapour have been measured under conditions of liquid-vapour equilibirum in the temperature range of 20-70C. Both signs of charge carriers have the same measured mobility and evidence is given for heavy ion clustering. These data are explained in terms of the Chapman-Enskog kinetic theory mobility equation and the clustering is shown to obey a thermal dissocation law.
W79-02076

2. WATER CYCLE

2A. General

COMPLEX RELATIONS BETWEEN THE HYDROLOGIC BUDGET OF THE MAJOR GEOGRAPHIC ZONES OF THE EARTH,
Akademiya Nauk SSSR, Moscow. Inst. Geografii.
A. V. Belyayev.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 30-37, 1977. 7 fig, 1 tab, 21 ref. Translated from News of the USSR Academy of Sciences, Geographic Series (Izvestiya Akad. nauk SSSR. Ser. geogr.), No. 1, p 38-50, 1977.

Descriptors: *Hydrologic budget, *Regions, *Hydrologic equation, *Mathematical models, Analytical techniques, Analysis, Hydrology, Evaporation, Precipitation(Atmospheric), Hydrologic cycle, Hydrologic aspects, Infiltration, Runoff, Runoff coefficient, Foreign research, Foreign countries, *USSR.

A system of zonal hydrologic relations was presented that combines zonal structural and interpolation relations according to a six-component system of hydrologic equations and on the principle of geographic zonality. Some properties of such relations were investigated, and analytic expressions for their descriptions were proposed. Values were tabulated of the relative characteristics of the hydrologic budget, including the coefficient of total wetting (W/P) and the runoff coefficient (R/P), taken from this complex zonal relations and corresponding to precipitation of 500 and 1000 mm. When the absolute amount of precipitation doubles (increases from 500 to 1000 mm), the total wetting coefficient decreases by an average of 7-14%, and the runoff coefficient increases by 23%, i.e., these relative characteristics do not vary very significantly with different amounts of precipitation within a single zone. Yet the change in the entire combination of physiographic conditions, besides precipitation, produces great changes in the structure of the hydrologic budget. For example, with a hypothetical precipitation of 1000 mm, more than twice as much water is spent on infiltration in savannas than in the tundra. The difference in the structure of total river runoff is also considerable. Whereas groundwater runoff accounts for only 8% of the total river runoff in the tundra, mainly because of permafrost which prevents the seepage of water to the water table, its proportion is 30% in the mixed forest zone of the temperate belt. (Humphreys-ISWS)
W79-02208

BROOK: A HYDROLOGIC SIMULATION MODEL FOR EASTERN FORESTS,
Forest Service (USDA), Durham, NH.
For primary bibliographic entry see Field 4D.
W79-02448

2B. Precipitation

DISASTER RESPONSE TO FLASH FLOOD,
Federal Water Pollution Control Administration, Denver, CO. South Platte River Basin Project.
For primary bibliographic entry see Field 8B.
W79-02193

DROUGHT IN THE UPPER MIDWEST, 1931-1969,
Iowa Univ., Iowa City. Dept. of Geography.
M. P. Klugman.
Journa of Applied Meteorology, Vol. 17, No. 10, p 1425-1431, October 1978. 4 fig, 3 tab, 18 ref.

Descriptors: *Droughts, *Precipitation(Atmospheric), *Central U.S., *Great Plains, *Climatology, Weather, Rainfall, Statistics, Statistical methods, Data collections, Analytical techniques, Data processing, Distribution patterns, Meteorology, Eigenvector analysis.

Monthly Palmer Drought Index values for the periods 1931-40, 1941-50, 1951-60, and 1961-69 were subjected to eigenvector analysis. Patterns and periods of variable moisture conditions resulted which fit the patterns found in drought studies of areas east and west of the upper Midwest. The 1930's and 1950's included years of severe drought, but the patterns of drought were not identical. The 1930's drought spread from the west; the 1950's drought spread from the south and southwest. The 1940's and 1960's were wetter than normal in the upper Midwest. (Sims-ISWS)
W79-02196

ANALYSIS OF ERROR IN THE DETERMINATION OF SNOW STORAGE FOR SMALL HIGH ARCTIC BASINS,
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2C.
W79-02197

FULL-SEASON RAIN GAUGE HAVING REPLACEABLE CHARTS FOR MAKING PROFILE GRAPHS,
For primary bibliographic entry see Field 7B.
W79-02304

REMOTE SENSING TECHNIQUES AND THE MONITORING OF DESERTIFICATION PROCESSES IN ARID AREAS,
Desert Inst. Ashkhabad (USSR).
For primary bibliographic entry see Field 7B.
W79-02390

2C. Snow, Ice, and Frost

ROOT PRODUCTION AND ROOT TURNOVER IN A WET TUNDRA ECOSYSTEM, BARROW, ALASKA,
Duke Univ., Durham, NC. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-02100

TELEMETRIC DETERMINATION OF SALMONID WINTER MICRO-HABITAT OCCUPATION AND MOVEMENT IN ICE-COVERED STREAMS,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 7B.
W79-02157

ANALYSIS OF ERROR IN THE DETERMINATION OF SNOW STORAGE FOR SMALL HIGH ARCTIC BASINS,
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
M. K. Woo, and P. Marsh.
Journal of Applied Meteorology, Vol. 17, No. 10, p 1537-1541, October 1978. 4 fig, 1 tab, 10 ref.

Descriptors: *Water balance, *Snowpacks, *Snow surveys, *Storage, *Arctic, *Canada, Snowmelt, Melt water, Runoff, Water resources, Snow, Snowfall, Watersheds(Basins), Tundra, Terrain analysis, Regression analysis, Data processing, Meteorology, *Snow storage.

Water balance studies in tundra regions require accurate snowfall data, but weather station records often underestimate basin snow storage. However, snow storage can be determined by snow surveys conducted prior to the melt period because Arctic snowpacks do not melt during winter. Topography strongly controls snow distribution. A basin can be subdivided into various terrain types, and the snow survey then establishes the snow characteristics of each terrain type so that basin snow storage is obtained as the areally weighted mean. Such a survey was carried out in small basins near Resolute, Northwest Territories, traversing different types of terrain. The results confirmed that weather station snowfall grossly understimated basin snow storage. Since it is also desirable to simplify future snow surveys by reducing the number of transects, an error analysis was performed to determine the error resulting from a grouping of terrain types. It was found that both maximum and mean error increased as the number of terrain types was reduced, but the increase was not substantial when certain terrain types were combined. A mean error of 15% is expected when only four types of terrain (hilltops, flats, gullies, valleys, and slopes) are recognized in the survey, but the error quickly increases when further simplification of the terrain is introduced. (Sims-ISWS)
W79-02197

COMPUTATION OF SOIL FREEZING DEPTH IN THE ZONE OF AERATION,
G. P. Zhmayeva.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 17-20, 1977. 2 fig, 8 ref. Translated from Transactions of the Hydrometeorological Scientific Research Center of the USSR (Trudy GMTs), No. 183, p 48-55, 1977.

Descriptors: *Zone of aeration, *Freezing, *Soils, *Mathematical models, Thawing, Unsaturated flow, Analytical techniques, Soil moisture, Depth, Mathematical studies, Equations, Foreign research, Foreign countries, Soil temperature, *USSR.

In some regions of the USSR, spring runoff losses are affected not only by soil moisture but also largely by the depth of soil freezing. Unfortunately, available network observations of freezing depth are insufficient in many cases to account for its effect because of observation shortages and also because of the large variations in freezing conditions over a drainage basin. A method was proposed for computing soil freezing depth on the basis of methods of mathematical physics. This method was designed for the use of standard observations at the station network of the Hydrometeorologic Service. Use of the proposed model of soil freezing (thawing) makes it possible to obtain the following additional information on this process: (1) the dynamics of the freezing front; (2) the vertical soil temperature distribution in the frozen and thawed zones; and (3) the variation of the soil moisture curve in the thawed zone. The proposed model was verified in the Kostroma River basin from standard observations over the period from 1955 to 1973. The computed and measured freezing depths were close. (Humphreys-ISWS)

W79-02215

PHYSICAL PROPERTIES OF ICEBERGS, PART I--HEIGHT TO DRAFT RATIOS OF ICEBERGS, PART II--MASS ESTIMATION OF ARCTIC ICEBERGS,
Coast Guard Research and Development Center, Groton, CT.
R. Q. Robe, and L. D. Farmer.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 240, Price codes: A05 in paper copy, A01 in microfiche. Report CG-D-102-76, June 1976. 25 p, 8 fig, 5 tab, 9 ref.

Descriptors: *Icebergs, *Mass, *Height, *Shape, Surveys, Remote sensing, Ice, Sea ice, Photography, Aircraft, Aerial photography, Data processing, Sonar, Height to draft ratios, Iceberg mass.

A study of height-to-draft ratios of icebergs near the Davis Strait revealed ratios which range from 1:1.28 to 1:10.56. The ratios of bergs dominated by their horizontal dimension, such as tabular or broken tabular icebergs, have average height-to-draft ratios of 1:4.46 and 1:4.26, respectively. Bergs with a more vertical nature, pinnacle or drydock bergs, have ratios averaging 1:2.31 and 1:2.41, respectively. The smallest ratios are found in domed bergs, which average 1:6.30. If it is assumed that the height-to-draft ratio of icebergs is characterized by a continuous distribution and then a Kruskal-Wallis one-way analysis of variance technique is used, the hypothesis that the average ratio of icebergs is not significantly different for gross visual shape classes can be tested. The result was that for the sample icebergs there is no significant difference. For summary purposes, the average of the averages (1:3.95) can be used as descriptive of the height draft ratio of icebergs regardless of visual shape class. Between the berg heights of 10 m and 60 m, which is the range of this sample, the height was related to the height-to-draft ratio by a power curve. Analysis of stereo pairs of 22 icebergs, in the region of Davis Straits, revealed that a reasonable estimate of total iceberg mass, in metric tons, can be arrived at by multiplying the gross dimensions of the iceberg (height x width x length) in meters together, and then multipying this produce by a factor of 3.01. This factor accounts for the density difference between seawater and freshwater ice; it also accounts for the average shape and mass distribuion of icebergs. (Sims-ISWS)
W79-02216

CONSTRUCTION AND OPERATION OF LOW-PRESSURE DAMS ON PERMAFROST SOILS,
For primary bibliographic entry see Field 8D.
W79-02220

SUPERCOOLING OF WATER TO -92 DEGREES C UNDER PRESSURE,
Purdue Univ., Lafayette, IN. Dept. of Chemistry.
H. Kanno, R. J. Speedy, and C. A. Angell.
Science Vol. 189, p 880-881, September 1975. 1 fig, 17 ref. OWRT B-051-IND(8).

Descriptors: *Supercooling, *Differential thermal analysis, Crystallization, Freezing, Nucleation.

The temperature at which 'clean' supercooled water freezes has been determined as a function of pressure up to 3 kilobars, using a differential thermal analysis technique on subdivided water samples. The supercooling limit of such samples, -38 degrees C at normal pressure, is lowered by initial increase of pressure, reaching a minimum value of -92 degrees C at 2.00 kilobars.
W79-02494

2D. Evaporation and Transpiration

THE MICRO-CLIMATE OF NARROW- AND WIDE-ROW SORGHUM WITH EQUAL PLANT DENSITIES,
Kansas State Univ., Manhattan. Evapotranspiration Lab.
J. J. Owonubi, E. T. Kanemasu, and W. L. Powers.
Agricultural Meteorology, Vol 15, p 61-69, 1975. 5 fig, 3 tab, 11 ref. OWRT A-056-KAN(2), 14-31-0001-3816.

Descriptors: *Evapotranspiration, Advection, *Sorghum, Microclimates, *Net radiation, *Sensible heat, Stomatal resistance, Leaf water potential.

Net radiation, evapotranspiration (lysimetric), soil heat flux, temperature, vapor pressure, and wind speed were measured within and above narrow- and wide-row sorghum with equal plant density. Total energy balance for 9 clear days showed no significant difference in net radiation (Rn) above the narrow and wide rows. Evapotranspiration (LE) accounted for an average of 88% and 89% of Rn in the narrow and wide rows, respectively. LE/Rn percentage was over 100 in the wide rows for August 25 and 26, 1973. The latter part of the growing season, temperature inversions above the crop canopies confirmed large-scale advection. Negative sensible heat at the beginning of the season and the below-canopy-energy balance suggest within-row advection, especially in wide row sorghum. Temperature decreased with downwind distance from a stubble field but vapor pressure increased with increasing distance. Stomatal resistance decreased and leaf-water potential increased (less negative) with downwind distance.
W79-02358

ADVECTION MODIFICATION OF THE PRIESTLEY AND TAYLOR EVAPOTRANSPIRATION FORMULA,
Wisconsin Univ.-Madison. Dept. of Soil Science.
W. A. Jury, and C. B. Tanner.
Agronomy Journal, Vol. 67, No. 6, p 840-842, November-December 1975. 2 fig, 7 ref.

Descriptors: *Advection, *Evapotranspiration, *Evaporation, Model studies, Radiation, Measurement, *Crop water requirements, *Net radiation, *Priestley-Taylor evaporation formula.

The empirical formula of Priestly and Taylor (Mon. Weather Rev. 100:81-92, 1972) relating the evapotranspiration from a well-watered surface to the net radiation and a function of the air temperature is modified to include a saturation deficit term to account for high local advection. The model is tested on two seasons of daily evapotranspiration measurements over irrigated potatoes resulting in good agreement and a substantial improvement over the unmodified formula. Alfalfa measurements are also represented well by the model, but no better than by the Priestley-Taylor formula calibrated during a period of high advection. (Skogerboe-Colo St)
W79-02395

EVAPOTRANSPIRATION ESTIMATES FOR WATER RIGHT TRANSFERS,
Wyoming Univ., Laramie. Water Resources Research Inst.
R. D. Burman, P. A. Rechard, and A. C. Munari.
In: Proceedings American Society Civil Engineers, Irrigation and Drainage Specialty Conference, Logan, Utah, Aug 13-15, 1975, p 173-195 (1975). 8 fig, 10 tab, 10 ref. OWRT B-003-WYO(5). 14-31-0001-3063.

Descriptors: *Evapotranspiration, *Water rights, *Water transfer, Irrigation, Streamflow, *Evapotranspiration estimates, *Blaney-Criddle method, Wyoming, Colorado, Nevada.

Current practice allows the transfer of seasonal evapotranspirtation minus effective rainfall when making a water right transfer from meadow irrigation to another use. This practice is equivalent to permitting the transfer of the effect of the meadow irrigation on streamflow. The Blaney-Criddle method is commonly used, with calculations made on a monthly basis. Estimates of evapotranspiration based on 15 methods were compared with measurements from four locations in Wyoming, Colorado, and Nevada. Monthly calculations were made using climatic data and lysimeter measurements. Inflow-outflow measurements made near Laramie were also used. Evapotranspiration was estimated for all months of data and for all sites. Without local calibration the Kohler, Nordenson and Fox method of estimating lake evaporation appears to be the most satisfactory method of estimating evapotranspiration from high-altitude native hay meadows. Using crop coefficients developed from Colorado, Wyoming, and Nevada, the Blaney-Criddle method appears to be the most satisfactory. Both the revised Blaney-Criddle and the Olivier methods appear to give reasonable estimates of streamflow depletion. For monthly calculations the Blaney-Criddle method with coefficients calibrated for mountain meadow conditions appears to yield satisfactory estimates.
W79-02491

2E. Streamflow and Runoff

SOME COMPARISONS OF FLOOD STATISTICS IN REAL AND LOG SPACE,
Geological Survey, Reston, VA. Water Resources Div.; and IBM Thomas J. Watson Research Center, Yorktown Heights, NY.
J. M. Landwehr, N. C. Matalas, and J. R. Wallis.
Water Resources Research, Vol 14, No 5, p 902-920, October 1978. 9 fig, 30 tab, 6 ref.

Descriptors: *Floods, *Historic floods, *Simulation analysis, *Monte Carlo method, *Stochastic processes, Evaluation, Real space, Log space.

Some statistics of historical and simulated flood data were examined in real and log space. Some statistical properties of floods in real space could not be inferred from those in log space without extensive knowledge of the distribution of floods in real space as well as information about its sampling characteristics. The construction and use of regional skew maps in log space are most likely counter productive. (Woodard-USGS)
W79-02119

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02121

FLOW CHARACTERISTICS OF STREAMS IN TUTUILA, AMERICAN SAMOA,
Geological Survey, Honolulu, HI. Water Resources Div.
I. Matsuoka.
Water-Resources Investigations 78-103 (open-file report), September 1978. 34 p, 7 fig, 1 plate, 6 tab, 13 ref.

Descriptors: *Streamflow, *Flow characteristics, *Low flow, *High flow, *Rainfall-runoff relationships, Hydrologic data, *American Samoa, *Tutuila.

The island of Tutuila is the economic and population center of American Samoa. It lies in the tropics and rainfall is abundant. Annual rainfall at upper Faga'alu reservoir averaged 207 inches during the period 1904-75. Available records show that altitude is a significant factor affecting the amount of rainfall. Small, steep basins generally yield perennial flow into streams but the amounts are small and sometimes highly variable. Low-flow frequency and correlation methods were used to determine flow characteristics. The total of the low-flow consecutive 7-day average discharges that can be expected at 10-year recurrence intervals at the 6 continuous-record gaging stations and the 45 partial-record stations analyzed is 5.2 cubic feet per second. About half of this total, 2.4 cubic feet per second, is from streams draining the southwestern part of the island where most of the water collection and distribution systems are being concentrated. High-flow frequency curves show the

instantaneous peak discharge of the maximum mean discharge for selected periods of consecutive days and its likelihood of occurrence. (Woodard-USGS)
W79-02124

MAGNITUDE AND FREQUENCY OF FLOODING ON THE MYAKKA RIVER, SOUTHWEST FLORIDA,
Geological Survey, Tallahassee, FL., Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-02129

FLOOD-PLAIN DELINEATION FOR CUB RUN BASIN, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Richmond, VA. Water Resources Div.
P. L. Soule.
Open-file report 78-17, 1978. 121 p, 78 fig, 12 tab, 4 ref.

Descriptors: *Flood profiles, *Flood plains, *Flood forecasting, *Flood frequency, *Analytical techniques, Design flood, Flood routing, Flood control, *Virginia, *Cub Run basin(Va), Fairfax County(Va), *Flood-plain mapping, *Flood-plain delineation.

Flood-plain delineation for Cub Run basin water-surface profiles of the 25-, 50-, and 100-year recurrence interval discharges have been computed for all streams and reaches of channels in Fairfax County, Virginia having a drainage area greater than 1 square mile except for Dogue Creek, Little Hunting Creek, and that part of the Cameron Run above Lake Barcroft. Maps having a 2-foot contour interval and a horizontal scale of 1 inch equals 100 feet have been used for base on which flood boundaries were delineated for 25-, 50-, and 100-year floods to be expected in each basin under ultimate development conditions. This report is one of a series and presents a discussion of techniques employed in computing discharges and profiles as well as the flood profiles and maps on which flood boundaries have been delineated for the Cub Run basin in Fairfax County. (Woodard-USGS)
W79-02137

CONTROL OF 1973 MISSISSIPPI RIVER FLOOD,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Lower Mississippi Valley Div.
For primary bibliographic entry see Field 4A.
W79-02195

STRUCTURAL CONTROL OF THE RAPIDS AND POOLS OF THE COLORADO RIVER IN THE GRAND CANYON,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, A. Howad, and D. Trimble.
Science, Vol. 202, No. 4368, p 629-631, November 10, 1978. 3 fig, 5 ref.

Descriptors: *Geologic control, *Colorado River, *Alluvial fans, *Colorado, Sediment load, Fractures(Geologic), Tributaries, Velocity, Bathymetry, Sounding, On-site investigations, Ponds, *Rapids, Structural control, *Grand Canyon, Debris.

Most of the major rapids along the 450 km course of the Colorado River in the Grand Canyon are within fracture zones that run perpendicular to the river. Steep tributaries flowing within the zones of bedrock weakness move large debris to the Colorado, forming the rapids. Accelerated flow through the rapids scours the deep pools that are located below them. (Visocky-ISWS)
W79-02200

FORECAST OF THE FLASH FLOOD HYDROGRAPH ON THE INGODA RIVER,
For primary bibliographic entry see Field 4A.
W79-02207

2F. Groundwater

THE ORIGIN OF LABYRINTH AND TOWER KARST AND THE CLIMATIC CONDITIONS NECESSARY FOR THEIR DEVELOPMENT,
Georgia Univ., Athens.
G. A. Brook, and D. C. Ford.
Nature, Vol 275, No 5680, p 493-496, October 12, 1978. 3 fig, 2 tab, 43 ref.

Descriptors: *Karst, *Canada, *Climates, Limestone, Dolomite, Humid climates, Subarctic, Karst hydrology, Erosion, Zoning, *Labyrinth karst, Tower karst, Karstlands, Nahanni karst, Natural rock labyrinths, Zonal climate.

A complex and accentuated karstland at 61-62 deg N in the Nahanni area of the Mackenzie Mountains, Northwest Territories, Canada, was explored and studied in 1972-74. The climate is subarctic, continental interior type, and there is a discontinuous permafrost. The findings added knowledge of karst styles and suggested that some relationships between karst morphology and climate be reassessed. A new karst style, labyrinth karst, was recognized in climates ranging from humid tropical to subarctic. These karst landscapes were identified in several humid and seasonally humid tropical carbonate terrains such as southwest Celebes, Indonesia, the Star Mountains and Lake A jamuru regions of New Guinea, and the Tanga region of Tanzania. They also were clearly visible in oblique photographs of the Sierra Maestra in Cuba and Arnhem Land, Northern Territory, Australia. In the late stages of evolution, labyrinth karst was replaced by limestone towers. This indicates that tower karst is polygenetic and not specific to the humid tropics as was once thought. (Roberts-ISWS)
W79-02073

PUBLIC GROUNDWATER SUPPLIES IN KANE COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W79-02075

TRITIUM IN THE WATERS OF YELLOWSTONE NATIONAL PARK,
Geological Survey, Menlo Park, CA., Water Resources Div., and Geological Survey, Menlo Park CA., Geologic Div.
F. J. Pearson, Jr., and A. H. Truesdell.
In: Short Papers of the Fourth International Conference, Geochronology, Cosmochronology, Isotope Geology, 1978: Open-file report 78-701, p 327-328, 1978. 3 fig, 1 ref.

Descriptors: *Groundwater movement, *Hot springs, *Geysers, *National parks, *Tritium, Surveys, Analytical techniques, Surface-groundwater relationships, Streams, Reservoirs, Mixing, Cold springs, *Yellowstone National Park.

Tritium content of both hot and cold waters in Yellowstone National Park was used to infer something of the ground-water system feeding hot springs and geysers. Curves in three figures show: (1) Tritium content of water leaving piston flow and well mixed ground-water systems in Yellowstone Park; (2) tritium in precipitation, mixed reservoirs, and cold waters of Yellowstone Park, and (3) tritium in mixed reservoirs and hot waters of Yellowstone Park. (Woodard-USGS)
W79-02130

GEOLOGY AND GROUNDWATER RESOURCES OF NORTHERN BERKS COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
C. R. Wood, and D. B. MacLachlan.
Pennsylvania Geological Survey, Harrisburg, Fourth Series, Water Resources Report 44, 1978. 91 p, 9 fig, 2 plates, 14 tab, 37 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Groundwater availability, *Water quality, Water utilization, Water wells, Water yield, Water level fluctuations, Surface-groundwater relationships, Groundwater recharge, Transmissivity, *Pennsylvania, Berks County(Penn).

The area of investigation is underlain chiefly by carbonate rocks in the south and by shale and graywacke in the north. Ground water is almost entirely confined to secondary openings that occur along bedding planes, faults, and other fractures. Yields of 1,000 gal/min are common in the better carbonate aquifers. Nondomestic wells in some of the poorer carbonate aquifers have median yields of less than 60 gal/min. Median yields of nondomestic wells in the noncarbonate aquifers generally range from 25 to 250 gal/min. Natural annual fluctuations of water levels in wells generally range from 3 to 20 feet. Areas of low water-level slope underlain by carbonate rocks generally coincide wtih areas of high transmissivity. Two areas of fluoride pollution result from soluble industrial wastes. Industrial wastes containing chromium polluted the water at Sinking Spring; and an area near Sinking Spring that was polluted by a gasoline spill in the early 1930's remains polluted in 1976. (Woodard-USGS)
W79-02132

MAJOR AQUIFERS IN CLARK COUNTY, SOUTH DAKOTA,
Geological Survey, Huron, SD. Water Resources Div.
L. J. Hamilton.
South Dakota Geological Survey, Vermillion, Information Pamphlet No. 16, 1978. 7 p, 5 fig, 1 tab.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water quality, *Groundwater availability, *Water utilization, Hydrologic data, Water wells, Water yield, Water levels, Chemical analysis, South Dakota, *Clark County(SD).

This information pamphlet is one of a series of reports on water-resources studies of South Dakota counties. It is designed to acquaint the reader with the general distribution, quantity, and quality of ground water available from the major aquifers in Clark County. The information is based on data collected by the U.S. Geological Survey and the South Dakota Geological Survey during the period 1973-76. Some of the physical and hydrochemical properties of six major glacial aquifers are summarized in the table. Three of the aquifers are grouped as the Prairie Coteau aquifers and the other three are grouped as the Altamont aquifers. Although most of the water in the Prairie Coteau aquifers and the Altamont aquifers is saline it has been a satisfactory supply for human and livestock consumption. The water may require treatment for other uses in order to reduce high concentrations of iron, manganese, and hardness. (Woodard-USGS)
W79-02134

POTENTIAL FOR DOWNWARD LEAKAGE TO THE FLORIDAN AQUIFER, GREEN SWAMP AREA, CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02136

GEOPHYSICAL DELINEATION OF BURIED GLACIAL RIVER VALLEY AQUIFERS IN GRUNDY COUNTY, MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
O. Malvik.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 707, Price code: A06 in paper copy, A01 in microfiche. M. A. Thesis, 1977, 102 p. 24 fig, 3 tab, 29 ref, 6 append. OWRT A-097-MO(2), 14-34-0001-7053 and 7054.

Descriptors: *Aquifers, *Missouri, *Groundwater sources, Groundwater, *Geophysical exploration, *Glacial aquifers, Bedrock, *Seismic refraction, *Gravity survey, Aquifer characteristics.

Buried glacial and preglacial river valley aquifers represent the major untapped ground-water resource in northwestern Missouri. Ground-water exploration and development is hindered by scarce well log data, variable glacial drift thickness, and encroachment of saline water from the cyclical Pennsylvanian sedimentary bedrock. A multiple geophysical approach was used to delineate the incised river valleys and to make inferences on ground-water quality. Computer display of gravity residuals was used to select areas for further investigation. Gravity profiling was used to define the shape of the channel and the position of its maximum depth. Seismic refraction and resistivity soundings were then used to further evaluate the buried valleys. The interpretations of the gravity residual map were complicated by saddles between gravity lows, and some suspected buried valley locations were not verified by further geophysical investigation. Gravity surveys, however, appear to be an effective reconnaissance tool in this area. Seismic refraction gave adequate drift-bedrock interface depths where well control was available, indicating that a velocity contrast exists in the study area. Resistivity sounding has been effective in sites where adequate resistivity contrasts exist between drift and bedrock. In other sites saline water encroachment or shallow fresh water aquifers may mask this interface. This three-fold geophysical evaluation appears to be effective in this area whereas any one approach would, by itself, be of little value.
W79-02154

FLOTATION OF FRESH WATER ON SEA WATER, A HISTORICAL NOTE,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
S. N. Davis.
Ground Water, Vol. 16, No. 6, p 444-445, November-December, 1978. 8 ref.

Descriptors: *Hydrogeology, *History, *Ghyben-Herzberg, Saline water intrusion, Freshwater, Sea water, Floating.

The historical development of the Ghyben-Herzberg principle is outlined. It was first stated by Pliny the Elder A. D. 23-79 that fresh water floats on salt water due to differences in density. However, owing to illogical statement on other matter his influence on contemporary and later thought was weak. Joseph DuCommun should receive credit for the first clear scientific explanation of the floatation of fresh ground water on sea water. DuCommun's work antedated publications by both Badon Ghyben and Herzberg by more than 60 years. Darwin inferred the principle in writing about shallow wells which recovered fresh water from small oceanic islands in 1845. Thus, the use of the term, Ghyben-Herzberg principle tends to perpetuate an incorrect understanding of an important step in the history of hydrogeology. An impersonal term such as 'the principle of static fresh-water floatation' should be substituted. (Purdin-NWWA)
W79-02171

SUBSURFACE STRATIGRAPHY AND WATER RESOURCES OF CASS COUNTY, INDIANA,
Purdue University West Lafayette, Indiana. Department of Geosciences.
For primary bibliographic entry see Field 4B.
W79-02185

FOSSIL GROUND-WATER GRADIENTS IN ARID REGIONAL SEDIMENTARY BASINS,
Birmingham Univ. (England). Hydrogeology Section.
J. W. Lloyd, and M. H. Farag.
Ground Water, Vol. 16, No. 6, p 388-393, November-December 1978. 5 fig, 1 tab, 16 ref.

Descriptors: *Groundwater movement, *Hydraulic gradient, *Arid lands, *Resistance networks, *Sedimentary basins(Geologic), Permeability, Specific yield, Carbon radioisotopes, Analog models, Groundwater resources, Groundwater recharge, Model studies, *Groundwater gradients, *Fossil gradients, Recharge mounds.

The hypothesis that present-day groundwater gradients in arid regional sedimentary basins are a decay feature of very old recharge mounds was examined using a resistance network analog. A longitudinal section model of a conceptual basin with some specific control of aquifer permeability and groundwater age was used. With reasonable combination of aquifer permeability and specific yield, it was shown that an acceptable head decay could have occurred over the past 10,000 years to produce the present-day gradient. In the model adopted, decreasing permeability with depth was found to be required to accord with 14C groundwater age data. Although the model is not considered to be definitive for any particular aquifer, the results showed that fossil gradient conditions could exist in the regional basins for long periods and should be taken account of in groundwater resources assessments. (Visocky-ISWS)
W79-02189

THE BLIND ZONE IN SEISMIC GROUNDWATER EXPLORATION,
James Madison Univ., Harrisonburg, VA. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W79-02190

TRANSIENT SPHERICAL FLOW TO A NONPENETRATING WELL WITH CONSTANT DRAWDOWN,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W79-02191

THE IMPACT OF THE USE OF HEAT PUMPS ON GROUNDWATER TEMPERATURES,
Northern Cheyenne Research Project, Lame Deer, MT.
For primary bibliographic entry see Field 4B.
W79-02192

ROLE OF GROUND WATERS IN THE FORMATION OF THE TOTAL RUNOFF OF A SMALL DRAINAGE BASIN IN THE FOREST ZONE,
For primary bibliographic entry see Field 4B.
W79-02211

LONG-PERIOD GROUND-WATER REGIME IN THE EXCESSIVELY WET ZONE OF THE EUROPEAN USSR,
E. A. Zal'tsberg.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 64-67, 1977. 1 fig, 1 tab, 7 ref. Translated from News of the All-Union Geographic Society (Izvestiya VGO), Vol. 19, No. 2, p 137-142, 1977.

Descriptors: *Groundwater, *Water level fluctuations, *Water table, *Frequency analysis, Hydrogeology, Cycles, Wet climates, Analysis, Analytical techniques, Statistical methods, Foreign research, Foreign countries, Time, Groundwater resources, *USSR.

Investigated is the relatively little known problem of the long-period cyclicity (periodicity in a particular case) of the groundwater regime in the excessively wet zone of the European USSR. Various methods are used to identify the cyclic (periodic) components in long-period observations, namely: construction of difference-integral curves, smoothing from moving n-year periods, and correlation, harmonic, and spectral analyses. The results of harmonic analysis and some additional data on the cycles were tabulated. Long-period fluctuations in the levels of ground and surface waters have the same main cause, i.e., cyclic climatic variations. Therefore, there is a definite similarity between these fluctuations. Having identified some cycle in long meteorological or surface water observation series, one can state with great probability that a cycle of the same (or close) duration must also be manifest in groundwater fluctuations. Three-year cycles of high amplitude, found in the fluctuations of the pre-spring groundwater level minima, are as distinctly revealed in winter air temperature series, according to the Lenigrad meteorological station. Consequently, the characteristics of the frequency structures of series of regime-forming factors are reflected in the frequency structure of groundwater level series. Periods of different duration (generally cycles), identified in groundwater level fluctuations, are caused to some extent by individual regime-forming factors and by the simultaneous effect of the combination of these factors. (Humphreys-ISWS)
W79-02212

AN EVALUATION OF ISOTOPE CONCENTRATIONS IN THE GROUND WATER OF SAUDI ARABIA,
Geological Survey, Riyadh (Saudi Arabia). Water Resources Div.
W. J. Shampine, T. Dincer, and M. Noory.
In: Proceedings of the International Symposium on Isotope Hydrology, held in Neuherberg, Federal Republic of Germany, June 19-23, 1978. 16 p, 9 fig, 2 tab, 16 ref.

Descriptors: *Groundwater, *Water quality, *Stable isotopes, *Dating, *Aquifers, Foreign countries, Deuterium, Tritium, Groundwater movement, Groundwater resources, Evaluation, Reviews, *Saudi Arabia, Umm-Er-Radhuma aquifer, Wasia aquifer, Neogene aquifer, Khobar aquifer, Oxygen-18, Sulfur-34, Carbon-13, Carbon-14.

Data on concentrations of oxygen-18, deuterium, tritium, sulfur-34, carbon-13, and carbon-14 have been collected in varying amounts from groundwater samples at more than 400 sites in Saudi Arabia. These data were collected during several hydrologic studies conducted in Saudi Arabia since 1967, most of which studied selected areas of the Arabian Shelf area of the kingdom. No new data were collected for this study, but all of the hydrologically oriented isotope data available in the kingdom have been compiled and summarized. A general assessment of the data is made which is useful to evaluate the quantity and quality of the data available as well as to indicate potential areas for future work. The compiled data also have permitted a general evaluation of the isotopic characteristics of the water in large, regional aquifer systems (about 800,000 sq km). (Woodard-USGS)
W79-02254

GROUND WATER...CALIFORNIA'S PRICELESS RESOURCE,
California Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 4B.
W79-02392

LAND SUBSIDENCE DUE TO WATER WITHDRAWAL IN THE VICINITY OF PECOS, TEXAS,
Cornell Univ., Ithaca, NY. Dept. of Engineering; and Cornell Univ., Ithaca, NY. Dept. of Applied Physics.
For primary bibliographic entry see Field 4B.
W79-02396

2G. Water In Soils

SUGAR CANE GROWTH IN RESPONSE TO MULCH AND FERTILIZER ON SALINE-ALKALI SUBSOILS,
Ministry of Overseas Development (England).
For primary bibliographic entry see Field 3C.
W79-02029

DISAPPEARANCE OF NITRATE UNDER TRANSIENT CONDITIONS IN COLUMNS OF SOIL,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
H. E. Doner.
Soil Biology and Biochemistry, Vol. 7, No. 4/5, July 1975. p 257-259. 3 fig, 8 ref.

Descriptors: *Nitrates, *Flow rate, Soil investigations, Soil chemistry, Leaching, Soil texture, Nitrogen, *Soil columns, *Transient flow conditions(Soils).

Previously a rapid reduction of NO3 was obtained in soil columns with continuous flow, before the establishment of steady state conditions. This initial behavior was not a function of flow rates. In order to determine what influence NO3 concentrations might have on transient and steady state rates, of NO3 loss, small soil columns were infiltrated with 0, 100 and 1000 micrograms ml(-1)NO3-N and the effluents were analyzed daily for NO3 and NO2. (Skogerboe-Colo St)
W79-02122

VOLATILITY OF MERCURY FROM SOILS AMENDED WITH VARIOUS MERCURY COMPOUNDS,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
For primary bibliographic entry see Field 5B.
W79-02142

INVESTIGATION OF MATRIX INTERFERENCES FOR AAS TRACE METAL ANALYSES OF SEDIMENTS,
Gulf South Research Inst., New Orleans, LA.
For primary bibliographic entry see Field 5A.
W79-02143

STREAMING-POTENTIAL EFFECTS IN SATURATED WATER FLOW THROUGH A SAND-KAOLINITE MIXTURE,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
S. Gairon, and D. Swartzendruber.
In: Ecological Studies. Analysis and Synthesis. Vol. 4, Edited by A. Hadas et al. Springer-Verlag Berlin - Heidelberg - New York p 141-151, 1973, 6 fig, 1 tab, 14 ref. OWRT B-005-IND(3).

Descriptors: Flow, *Saturated flow, *Porous media, Electrical properties, Electric fields, Sand, Kaolinite, *Streaming potential, *Electrical Potential difference.

The electrical potential difference across a permeameter filled with a mixture of 12.5% kaolinite and 87.5% sand was measured for saturated flow of water containing 20 ppm of mercuric chloride. Measurements were taken continuously for alternate periods of rest and flow ranging from as small as 15 min to as large as 24 hr. Both silver-silver-chloride and bright plantinum electrodes were placed in the end reservoirs of the permeameter to obtain electrical measurements, and the entire flow apparatus was enclosed in a grounded copper-screen Faraday cage. Even so, electrical potential differences observed continuously over 24-hr periods showed considerable variation with both types of electrodes. The only consistent response, qualitatively and quantitatively, was the step change in electrical potential at the time of initiation or cessation of hydraulic flow. The direction and magnitude of this 'E step' were consistent with those of the streaming-potential phenomenon. The magnitude of the E step was essentially proportional to the hydraulic gradient causing the liquid flow, and was thus in conformity with classical double-layer theory. Water flux also was closely proportional to the hydraulic gradient.
W79-02160

SIMULATED FLOW THROUGH THE ROOT XYLEM,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Soils and Crops.
For primary bibliographic entry see Field 2I.
W79-02199

COMPUTATION OF SOIL FREEZING DEPTH IN THE ZONE OF AERATION,
For primary bibliographic entry see Field 2C.
W79-02215

THE NATURE OF BASALT WEATHERING IN ISRAEL,
Hebrew Univ., Jerusalem, Rehovoth (Israel). Dept. of Soil and Water Science.
A. Singer.
Soil Science, Vol. 125, No. 4, p 217-225, April, 1978. 5 fig, 17 ref.

Descriptors: *Weathering, Soil formation, *Basalts, Aeolian soils, Saprolites, Clay minerals, Quartz, *Israel.

Three major weathering forms of upper Cenozoic basalts are recognized: a weathering crust, several millimeters thick, at the interface with the massive basalt; a weathering zone, several centimeters thick, associated with vesicular basalt; and thoroughly altered basalt saprolite, mostly obtained under prolonged water-saturated conditions. The clay fractions in the weathering crust and zone consist of smectite and kaolinite with halloysite, while, in the saprolite, smectite is the only clay mineral formed. Si02/A1203 ratios change from 6-7 in the rock to 2-3 in the crust clay, and this decrease represents maximum desilication obtained under eastern Mediterranean conditions. With soil development, a resilication of soil clays relative to crust clay may take place in the deeper stable profiles. Soil development also involves aeolian accumulation of quartz in the coarser size fractions, and Fe and K enrichment in the clay fraction. Grumusols (Vertisols) represent the mature, stable end products of basalt weathering on uneroded surfaces in the semiarid and subhumid parts of the eastern Mediterranean. In the more humid parts, Red and Brown Mediterranean soils (Xeralfs) become dominant. (Skogerboe-Colorado State)
W79-02238

A COMPUTER SIMULATION OF PHOSPHATE AND NITROGEN TRANSPORT BY WATER RUNOFF,
Technion - Israel Inst. of Tech., Haifa. Soils and Fertilizers Lab.
For primary bibliographic entry see Field 5B.
W79-02251

THE ORGANIC SEDIMENTS OF CORKSCREW SWAMP SANCTUARY,
Central and Southern Florida Flood Control District, West Palm Beach, FL.
For primary bibliographic entry see Field 2H.
W79-02284

DISSOLVED HYDROGEN SULFIDE IN SOIL WATER IN SAN FELASCO HAMMOCK AND DEERHAVEN CYPRESS DOME,
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5B.
W79-02285

APPLICATION OF THE ELECTRICAL DOUBLE LAYER THEORY TO PREDICT ION ABSORPTION IN MIXED IONIC SYSTEMS,
Technion-Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 2K.
W79-02314

CHEMICAL CHARACTERIZATION OF LOCAL AND STRATOSPHERIC PLUTONIUM IN OHIO SOILS,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5A.
W79-02320

THE BEHAVIO OF SULFATE ON SALT INPUT IN PODZOLIC BROWN EARTH,
Goettingen Univ. (West Germany). Inst. fuer Bodenkunde und Waldenaehrung.
For primary bibliographic entry see Field 2K.
W79-02321

MATERIAL CONTENT OF BINARY PHYSICAL MIXTURE AS MEASURED WITH A DUAL-ENERGY BEAM OF GAMMA RAYS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
D. L. Nofziger, and D. Swartzendruber.
Journal of Applied Physics, Vol 45, No 12, p 5443-5449, December 1974. 6 fig, 1 tab, 15 ref. OWRT B-014-IND(8).

Descriptors: *Instrumentation, *Soil moisture meter, *Gamma rays, Soil moisture movement, Equipment, Cesium, *Dual-energy beams, Soil moisture measurement, Soil density, Americium.

The content of water and soil in physical intermixture was measured simultaneously and nondestructively by the attenuation of a dual-energy beam of gamma rays. The beam, 1 mm by about 3 cm in cross section, was devised by placing a 280-mCi source of 137Cs behind a 389-mCi source of 241Am, with lead collimators suitably aligned in front of each source and the scintillation probe. The probe was connected in parallel to two-separate amplifier-analyzer-scaler systems, one being set in the integral mode to receive all pulses greater than 550 keV (for 137Cs, 662-keV peak), with the other being set in the differential mode to receive all pulses in a band 35-85 keV (for 241Am, 60-keV peak). When related to the count intensity in the high-energy range, the count intensity caused by 137Cs in the low-energy band was empirically found to be independent of the material in the binary mixture (soil and/or water) placed in the beam for measurement. Also, e could be well expressed by a cubic polynomial that was then used along with a dead-time correction to determine the attenuated count intensity attributable to the 241 Am source alone. Calibration of the system was then possible. Over-all measuring accuracy was on the order of plus or minus 0.01 cm3/cm3 in water content and plus or minus 0.04 cm3 or g/cm3 for a counting period of 5 sec.
W79-02356

ELECTRICAL POTENTIALS DURING WATER ENTRY INTO AN AIR-DRY MIXTURE OF SAND AND KAOLINITE,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
D. Swartzendruber, and S. Gairon.
Soil Science Vol. 120, No. 6, p 407-411, 1975. 4 fig, 3 ref. OWRT B-005-IND(4).

Descriptors: *Water flow, *Saturated flow, *Porous media, Electrical properties, Electrical fields, Sand, Kaolinite, Seepage, *Streaming potential, *Electrical potential difference.

Electrical potentials were observed for the upward entry of water into columns of air-dry mixtures of sand and kaolinite. The electrical potential difference was measured between two bright platinum electrodes, one being in the water chamber at the inlet (lower) end of a column, and the other being one of five separate electrodes placed in the sand-kaolinite at various positions along the column. Time records of electrical potential at the various electrodes, obtained with a high-resistance electrometer and a strip-chart recorder, exhibited characteristic negative peaks that could be very closely associated with the arrival of the visual wet front at the various electrodes. Thus, although the observed electrical potentials cannot be used to infer streaming potentials for the unsaturated flow process of water entry into air-dry soil, it does appear that such potentials can be used to trace quantitatively the progress of a wet front through the soil, under circumstances wherein visual observations are not possible or feasible.
W79-02357

MECHANISM OF ZINC ADSORPTION BY IRON AND ALUMINUM OXIDES,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
For primary bibliographic entry see Field 2K.
W79-02359

REACTION PRODUCTS AND SOLUBILITY OF APPLIED ZINC COMPOUNDS IN SOME MANITOBA SOILS,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
For primary bibliographic entry see Field 2K.
W79-02362

RESIDUAL FORMS OF FERTILIZER NITROGEN IN FIELD SOILS,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
For primary bibliographic entry see Field 2K.
W79-02364

HULA VALLEY PEAT: REVIEW OF CHEMICAL AND GEOCHEMICAL ASPECTS,
Hebrew Univ., Jerusalem (Israel) Dept. of Organic Chemistry.
For primary bibliographic entry see Field 2K.
W79-02365

REDUCTION OF NITRATE IN A SOIL COLUMN DURING CONTINUOUS FLOW,
California Univ., Berkeley. Dept. of Biology.
M. S. Ardakani, L. W. Belser, and A. D. McLaren.
Soil Science Society of America Proceedings, Vol. 39, No. 2, p 290-294, March-April 1975. 5 fig, 21 ref.

Descriptors: *Nitrates, *Denitrification, Soil environment, Soil investigations, Bacteria, Soil tests, Soil bacteria, Soil chemistry, Loam, Nitrogen, *Soil columns. Nitrate-nitrogen.

A column packed with a homogeneous Hanford sandy loam soil was perfused continuously with a solution containing 200 ppm NO3(-)-N and 2400 ppm glucose-C. Weekly estimates of denitrifiers showed that populations increased from 10(2) to > 10(8)/g of soil. Denitrifiers were most abundant near the surface where NO3(-)-N almost totally disappeared from the soil solution. An organic matter profile characterized by a surface layer developed within 3 weeks. Accumulated organic N accounted for about 4% of the total applied NO3(-)-N while the remaining 96% disappeared, presumably by dissimilation, within the top 0.5 cm of the surface layer. Normalized rate constants from 1.2 times 10(-5) ppm/hour cm3 per organism were estimated for dissimilation of NO3(-)N from its profiles. In a similar experiment, but without added glucose, less of the NO3(-)-N disappeared from solution; the percentage decreased from 40 to 15% with time. (Skogerboe-Colo St)
W79-02366

DIFFERENTIAL EFFECT OF BERMUDA AND BAHIAGRASSES ON SOIL CHEMICAL CHARACTERISTICS,
Georgia Univ., Athens. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W79-02381

MODEL FOR DECOMPOSITION OF ORGANIC MATERIAL BY MICROORGANISMS,
Utah State Univ., Logan. Ecology Center.
H. Parnas.
Soil Biology and Biochemistry, Vol 7, No 2, p 161-169, March 1975. 8 fig, 1 tab, 11 ref.

Descriptors: *Model studies, *Decomposing organic matter, Organic matter, *Microorganisms, Soil investigations, *Microbial degradation, *Mineralization.

A theoretical model which gives the rate of microbial decomposition of organic material (plant or animal residues, or soil organic matter) is presented. Explicit equations for the rate of decomposition, mineralizations, and immobilization are given. The main assumption of the model is that the rate of decomposition of any substrate is proportional to the growth rate of its decomposers. Some results of the model are: (1) Addition of extra nitrogen to materials poor in nitrogen increases their rate of decomposition; (2) Addition of extra nitrogen to a substrate whose initial carbon/nitrogen ratio is above a critical ratio (20-30) causes a decrease in the substrate's carbon/nitrogen ratio during its decomposition; (3) If the initial carbon/nitrogen ratio is below the critical one, no change in the substrate's ratio will occur with time. All the model results are analytical and independent of the values for the various parameters. Nevertheless the application of the model to real field conditions is discussed while presenting a numerical example. (Skogerboe-Colo St)
W79-02415

FIELD PERSISTENCE AND MOVEMENT OF TRIFLURALIN IN TWO SOIL TYPES,
Tennessee State Univ., Nashville.
D. R. Duseja, and E. E. Holmes.
Soil Science, Vol 125, No 1, p 41-48, January, 1978. 1 fig, 8 tab, 27 ref.

Descriptors: *Herbicides, Weed control, Weeds, Johnson grass, Oats, Movement, Persistence, Trifluralin, Soil types.

Trifluralin (alpha, alpha, alpha-trifluoro-2, 4, dinitro-N, N-dipropyl-p-toluidine) was applied in 1973 to Egam load and Beason clay field plots. Trifluralin persistence and movement in both soils was essentially the same, even though higher herbicide rates were applied to Beason clay, according to manufacturer's recommendations. There was an increasing trend of herbicide residues with excessive rates of trifluralin application. The herbicide essentially dissipated from soils in 5 months, with only 2.1 percent and 0.4 percent of the initially applied amounts remaining in the soil profile, in the Egam and Beason soils, respectively, at the highest (two times) rate of herbicide application. No herbicide was detected in the soil the following spring (11 months after application). Herbicide persistence could be described by a first-order kinetics. Downward movement of trifluralin under the conditions of this experiment did occur to the 8 in depth; further penetration of herbicide was essentially nil. Apparently, upward movement of trifluralin also occurred under these conditions. The control of Johnson grass and two broadleaf weed species present in the soil lasted from four to five weeks only. (Skogerboe-Colorado State)
W79-02417

ECOLOGICAL EFFECTS OF HIGHWAY CONSTRUCTION UPON MICHIGAN WOODLOTS AND WETLANDS: SOIL RELATIONSHIPS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Science.
For primary bibliographic entry see Field 6G.
W79-02429

EFFECTS OF TEMPERATURE AND TIME ON HYDROXY ALUMINUM PHOSPHATE-MONTMORILLONITE COMPLEX,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
M. D. Webber.
Soil Science, Vol 125, No 2, p 107-114, February, 1978. 3 fig, 3 tab, 16 ref.

Descriptors: *Montmorillonite, *Aluminum, *Phosphates, *Clay minerals, Temperature, Time, Solubility, Suspension, Aerobic conditions, Acidic soils.

Hydroxy aluminum phosphate-montmorillonite complex persisted for 320 days in aqueous aerobic suspensions that exhibited a pH range of 2.5 to 3 and were maintained at 10, 25, and 35C. There were small changes in its chemical and x-ray diffraction properties with time, and these occurred more quickly as the temperature was raised. It persisted for 100 to 200 days at 50C, but then variscite formed and interlayer material disappeared from the clay. Solubility calculations indicated that preparations containing the complex were undersaturated with respect to gibbsite and supersaturated with gibbsite, but saturated with variscite. Seeding the preparations with variscite and aging at 25C did not cause variscite to form. It is postulated that amorphous hydroxy aluminum phosphate, which is an important soil-fertilizer reaction product and a good source of phosphorus for plants on neutral soil, is likely to persist indefinitely in temperate acid soils. (Skogerboe-Colorado State)
W79-02436

YIELD RESPONSE TO SOIL WARMING: AGRONOMIC CROPS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W79-02490

WATER INFILTRATION INTO UNIFORM AND STRATIFIED SOILS I. REVIEW AND USE OF AN APPROXIMATE THEORY,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
M. Asseed, and D. Swartzendruber.
The Libyan Journal of Agriculture, Vol 3, p 19-26, 1974. 2 fig, 20 ref. OWRT A-004-IND(7).

Descriptors: *Water infiltration, *Water content, *Hydraulic conductivity, *Unsaturated flow, Diffusivity, Conductivity, Soil water movement, Least squares method, Approximation method, Soil horizon, *Green-Ampt Equation, *Approximate theory, Soil strata.

The equations of the approximate infiltration theory of Green and Ampt are much simpler than the mathematical forms of the diffusivity-conductivity theory of soil-water movement, and also involve parameters of characterization that are easier to measure experimentally. For cumulative water infiltrated into uniform soil as a function of time, these parameters are: the initial water content of the soil, the constant mean water content behind the wet front, a soil constant akin to the hydraulic conductivity of nearly saturated soil, and an equivalent constant head of water arising from the capillary properties of the soil. For fitting of the Green and Ampt equation to experimental infiltration data, a least-squares approach was developed, and was found to work very satisfactorily for measurements made on sand-silt mixtures. The approximate theory was applied to infiltration into stratified soils, thus involving the parameters of characterization of each stratum. Analysis was carried out for two and three strata, and can be continued for as many strata as desired. The resulting equations, however, become increasingly complicated, especially for the larger values of time at which the wet front has advanced into successively deeper strata. (See also W79-02493)
W79-02492

WATER INFILTRATION INTO UNIFORM AND STRATIFIED SOILS II. EXPERIMENTAL EVALUATION OF AN APPROXIMATE THEORY,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
M. Asseed, and D. Swartzendruber.
The Libyan Journal of Agriculture, Vol 4, p 129-140, 1975. 5 fig, 4 tab, 6 ref. OWRT A-004-IND(8).

Descriptors: *Water infiltration, *Water content, *Hydraulic conductivity, *Unsaturated flow, Diffusivity, Conductivity, Soil water movement, Least squares method, Approximation method, Soil horizon, *Green-Ampt equation, Approximate theory, Soil strata.

Downward infiltration of water into laboratory flow columns was studied experimentally for two different sand-silt mixtures designated as 'coarse' and 'fine'. Data were taken to assess the validity of infiltration equations derived by the Green and Ampt approach for both uniform and stratified columns. For uniform columns, the equation for cumulative water infiltrated versus time accommodated the experimental data very well, and was fitted by least squares. Two characterizing constants are C, which is akin to a hydraulic conductivity, and P, which arises from the capillary of the porous material. Although both C and P exhibited as much as a 2-fold variation for a given material, their respective mean values distinguish very well between the coarse and fine mixtures, and also provided the correct sense of C being markedly

smaller for the fine material than for coarse, and of P being larger for fine material than for coarse. For stratified columns, the corresponding equations were tested by predicting cumulative water infiltration versus time, based upon the parameters C and P determined from uniform columns. These predictions agreed reasonably well with the direct measurements on the stratified columns, with one exception for a fine-over-coarse stratification after the wet front had penetrated into the coarse substratum relatively deeply in comparison with the thickness of the fine upper stratum. (See also W79-02492)
W79-02493

2H. Lakes

A DYNAMIC LAKE MODEL FOR TROPHIC STATE PREDICTION,
Eidgenoessische Anstalt fuer Waserversorgung, Abwasserrinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W79-02006

EXAMINATION OF A LAKE MODEL,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5C.
W79-02007

A SIMULATION MODEL FOR PHYTOPLANKTON GROWTH AND NUTRIENT CYCLING IN EUTROPHIC, SHALLOW LAKES,
For primary bibliographic entry see Field 5C.
W79-02008

ORGANISM PATCHINESS IN LAKES RESULTING FROM THE INTERACTION BETWEEN THE INTERNAL SEICHE AND PLANKTONIC DIURNAL VERTICAL MIGRATION,
Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.
For primary bibliographic entry see Field 5C.
W79-02009

A MATERIAL BALANCE STUDY OF POLYCHLORINATED BIPHENYLS IN LAKE MICHIGAN,
Dow Chemical Co., Midland, MI. Environmental Science Research Lab.
For primary bibliographic entry see Field 5C.
W79-02017

PREDICTION OF PHYTOPLANKTON PRODUCTIVITY IN LAKES,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W79-02055

VEGETATION CHANGES IN A SMALL MICHIGAN BOG FROM 1917 TO 1972,
Michigan Univ., Pellston. Biological Station.
C. R. Schwintzer, and G. Williams.
The American Midland Naturalist, Vol 92, No 2, p 447-459, October, 1974. 2 fig, 2 tab, 17 ref.

Descriptors: *Vegetation, *Bogs, *Succession, *Michigan, Flooding, Drainage, Water levels, Weather patterns, Trees, Mortality, Marshes, Wetlands, Bog forest, Chamaedaphne.

Quantitative descriptions of the vegetation and maps of the pool of Bryant's Bog are available for several years since 1917 providing an opportunity for direct observations of bog succession. The vegetation advanced into the bog pool in an irregular manner at an average rate of 2.1 cm/year. In 1972 the pool was 76% of its extent in 1926. The vegetation changed in a successional series from the Chamaedaphne association of 1917 to the high bog-shrub association in the dry years of the 1920's to a bog forest which was well established in the late 1960's. It regressed in the early 1970's when many of the trees died and the Chamaedaphne association appeared to be re-establishing itself. The most probable cause of tree mortality was flooding caused by exceptionally high water levels due to natural weather cycles. Tree mortality was also found in Hoop Lake Bog - which, like Bryant's Bog, lacks aboveground drainage - while none occurred in bogs with aboveground drainage. (Maroncelli-Mass)
W79-02091

AQUATIC INVERTEBRATE ABUNDANCE IN RELATION TO CHANGING MARSH VEGETATION,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
D. K. Voigts.
The American Midland Naturalist, Vol. 95, No. 2, p 313-322, April, 1976. 1 fig, 1 tab, 28 ref.

Descriptors: *Aquatic animals, *Invertebrates, *Marsh plants, *Waterfowl, Wildlife, Crustaceans, Gastropods, Aquatic insects, Nesting, Aquatic vegetation, Rooted aquatic plants, Freshwater plants, Vegetation, Submerged plants, Floating plants, Marshes, Iowa, Emergent vegetation, Avian nesting, Avian nesting season.

The relationship between invertebrate populations and vegetative cover was studied in several Iowa marshes during the peak of the avian nesting season. Shallow water with emergent and floating dead vegetation produced the most isopods, planorbid snails and physid snails. Physid snails had another abundance peak in areas where submerged plants were found below dense free-floating plants. Midges reached greatest abundance in more open habitats somewhat protected from the wind. Amphipods were the most numerous invertebrate taxa and were most abundant in dense beds of submerged vegetation. Cladocera and copepods were most common in quiet pools with little vegetation. Total invertebrate abundance increased as the emergent vegetation was replaced by submerged vegetation, but maximum numbers occurred where beds of submerged vegetation were interspersed with stands of emergent vegetation. It is suggested that nesting marsh birds are attracted to marshes that produce the most invertebrates. (Maroncelli-Mass)
W79-02095

GEOGRAPHIC VARIATIONS IN SALT MARSH MACROPHYTE PRODUCTIONS: A REVIEW,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
R. E. Turner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 795, Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Reprint No. LSU-R-76-015, 1976. Reprinted from: Contributions in Marine Science, Vol. 20, p 47-68, 1976. 9 fig, 7 tab, 74 ref.

Descriptors: *Primary productivity, *Rooted aquatic plants, *Atlantic coastal plain, *Gulf coastal plain, *Reviews, Aquatic plants, Wetlands, Marshes, Biomass, Spartina alterniflora, Over-wintering biomass, Reviews, Bibliographies.

A literature review of salt marsh macrophyte production measurements supports the conclusion of a north-south gradient which parallels solar energy inputs at a 0.20-0.35% net conversion efficiency. There is also a latitudinal gradient of live biomass which over-winters. Considerable variation exists within and among marshes. Methods previously employed to measure salt marsh macrophyte production have generally under estimated the actual net above-ground production because of an inability to account for the turnover of live material between sampling periods. Turnover apparently increases with decreasing latitude and may be equal to annual changes in standing live biomass. The effect of other factors influencing production are discussed and a detailed data review presented. (Stihler-Mass)
W79-02098

PRIMARY PRODUCTION IN A SHALLOW WATER LAKE WITH SPECIAL REFERENCE TO A REED SWAMP,
Odense Univ. (Denmark). Biological Inst.
For primary bibliographic entry see Field 5C.
W79-02103

WATER LEVEL FLUCTUATION IN A NORTHEASTERN ONTARIO PEATLAND,
Toronto Univ. (Ontario). Dept. of Botany.
T. S. Dai, V. F. Haavisto, and J. H. Sparling.
Canadian Journal of Forest Research, Vol. 4, No. 1, p 76-81, March, 1974. 5 fig, 13 ref.

Descriptors: *Water level fluctuations, *Bogs, Wetlands, Fen, Water levels, Runoff, *Peatlands, *Ontario, *Canada.

Depths to water level and changes due to local climate were dissimilar in five peatland conditions--kale surface, black spruce bog, stagnant spruce site, lagg area, and poor fen. The deepest water level and the greatest fluctuations occurred in the ombrotrophic black spruce bog. The sedge-dominated poor fen site was submerged following every heavy rain; waterlogged conditions remained with 6 cm of the surface at all times because of the influence by the water level of Dai Lake. Water level of the lagg site was above the surface following every heavy rain during a 12-day period in early August. This site was affected by continuous inflow, high water levels, and fast runoff, therefore, a large flucutation of water level prevailed at this site. The water level of Dai Lake varied with a narrow range because the loss of water was primarily dependent on slow seepage and evaporation. Lowest water level during the summer of 1967 was recorded on July 11 at every site. (Stihler-Mass)
W79-02105

FORESTED WETLANDS OF FLORIDA-THEIR MANAGEMENT AND USE,
Georgia State Univ., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 6B.
W79-02112

THE PRODUCTIVITY OF LAKE CHAMPLAIN WIT REGARD TO WATERFOWL, FURBEARERS, AND OTHER WILDLIFE,
Vermont Dept. of Fish and Game, Montpelier.
T. R. Myers, and D. D. Foley.
Prepared under contract to Fish and Wildlife Service, Newton Corner, Massachusetts, for the International Joint Commission, August, 1977. 175 p, 7 fig, 55 tab, 281 ref. 14-16-0005-6056.

Descriptors: *Wetlands, *Lakes, *Wildlife habitat, *Water level fluctuations, Wildlife, Waterfowl, Water levels, Reservoir management, Furbearers, Aquatic animals, Marsh plants.

Of concern to waterfowl, furbearers, and other wildlife dependent upon wetland habitat along Lake Champlain is the potential for loss or drying out of wetlands as a direct result of proposed lake level regulation. From the stage-area information generated from the study, it is significant that substantial acreages of productive wetlands lie at contour intervals above maximum spring high limits allowed under regulation plans being considered. Should these areas receive no further periodic inundation, they would fall to retain their wetland charcter and revert to terrestrial vegetative types. The end product would be a vastly diminished wetland resource adjacent to Lake Champlain with considerable adverse impact on higher and lower life forms dependent on this wetland complex. Composition and quality of remaining wetland habitat could be substantially different with regard to meeting wildlife needs. (Steiner-Mass)
W79-02114

APPARENT USE OF SEDIMENT NITROGEN AND PHORPHORUS BY PLANTS IN MALLETTS CREEK MARSH WITH IMPLICA-

TIONS TO LAKE CHAMPLAIN WATER LEVEL REGULATION,
Geological Survey, Albany, NY.
J. T. Turk.
Prepared under contract to Fish and Wildlife Service, Newton Corner, Massachusetts, for the International Joint Commission, August, 1977. 19 p, 10 fig, 10 tab, 9 ref.

Descriptors: *Nitrogen, *Phosphorus, *Marsh plants, Wetlands, Marshes, Freshwater marshes, Rooted aquatic plants, Nutrients, Nutrient cycling.

Nitrogen and phosphorus dissolved in the interstitial water of the marsh sediments are a significant source of nutrients for rooted macrophytes and are capable of supplying 42 and 9 percent, respectively, of the plant requirements. During periods of low surface-water input in mid- and later-summer, interstitial nitrogen and phosphorus may supply an even larger percentage of the plant nutrient requirements. Excessive fluctuations in water level in the spring or early summer could increase the supply of nitrogen and phosphorus to Lake Champlain and decrease the growth of rooted macrophytes within the marsh. (Steiner-Mass)
W79-02115

LIMNOLOGY OF SELECTED LAKES IN OHIO - 1975,
Geological Survey, Columbus, OH., Water Resources Div.
R. L. Tobin, and J. D. Youger.
Water-Resources Investigations 77-105 (open-file report), September 1977. 205 p, 48 fig, 90 tab, 78 ref.

Descriptors: *Ohio, *Lakes, *Limnology, *Water quality, *Thermal stratification, Water chemistry, Nutrients, Phytoplankton, Algae, Bacteria, Pesticides, Anaerobic conditions, Dissolved solids, Dissolved oxygen, Cations, Anions, Coliforms, Light penetration, Secchi disks, Inflow.

Seventeen Ohio lakes were evaluated in 1975 for water quality status. Spring and late summer data included physical and profile measurements for a broad spectrum of chemical and biological constituents. Secchi disk transparency ranged from 0.1 to 2.9 meters. Thermal stratification or stability is shown for 10 lakes deeper than 4.6 meters. Anaerobic conditions, and high concentrations of ammonia, carbon dioxide, and hydrogen sulfide, developed in all thermally stabilized lakes. Maximum dissolved oxygen was measured at 20.8 milligrams per liter (229 percent saturation) in Paint Creek Lake. Calcium was the dominant and (or) codominant cation and bicarbonate and (or) sulfate the dominant anions in all lakes sampled. Two lakes, Hope and Vesuvius, had soft water. Specific conductance ranged from 128 to 510 micromhos. Pesticides were not detected except in Action Lake, and concentrations of one or more trace metals were above State limits in 10 lakes. Fecal coliform counts were generally low and exceeded 400 colonies per 100 milliliters in four lakes during runoff events. Blue-green algae dominated the summer phytoplankton communities in 16 lakes, with maximum densities greater than two million cells per milliliter. (Woodard-USGS)
W79-02126

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULATIONS IN LAKES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W79-02152

TRACE ELEMENT OF THE SARDIS RESERVOIR, MISSISSIPPI, AS RELATED TO CLAY MINERAL DISPERSION,
Mississippi Univ., University. Dept. of Geology and Geological Engineering.
W. R. Reynolds.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 705, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute, Mississippi State University, Mississippi State. Report October 1978, 62 p, 12 fig, 13 tab, 26 ref. OWRT A-115-MISS(1), 14-34-0001-8026.

Descriptors: *Reservoirs, Sedimentation, Geochemistry, *Trace elements, *Distribution patterns, Migration, Profiles, *Sediment distribution, Sediments, *Geochemistry adsorption, Surfaces, Sorption, Expansive clay, *Clay minerals, Sediments, Reservoirs, Illite, Kaolinite, Montmorillinite, Cation adsorption, *Mississippi, *Sardis Reservoir(Miss), *Bottom sediments.

Bottom sediment of Sardis Reservoir which is located in Northcentral Mississippi has a mineral composition as determined by x-ray diffraction of quartz, feldspar, calcite and the clay minerals montmorillonite, kaolinite and illite. The clays together are the dominant fraction of which kaolinite is the dominant species. Trace element content is restricted to the clay fraction and includes Mg, Zn, Ni, Ca and Fe. Lead and copper were also detected but only in a few samples. Concentrations of trace elements were determined by atomic absorption spectrophotometry. Entropy ratio mapping of sediment mineralogy revealed nearly complete mixing of all minerals, especially those of the clay group. Multiple regression analysis of trace element composition suggested natural contribution only from multiple land sources with complete mixing for some elements and spastic mixing for others in the reservoir proper. Summer thermal stratification of Sardis water controls only the deposition of iron. Otherwise, the depositional behavior of the remaining elements can mostly be related to the dispersion of clay. High and equal covariance was found between Mg, Zn, and Fe (winter deposition only) which indicates identical behavior. Furthermore, there is excellent correlation between these elements and montmorillonite. Moderate correlation was found between Ni and kaolinite. Calcium, however, could not be related to any of the clay species. Finally, there was no evidence for a relation between illite and any of the trace elements.
W79-02187

TIRE MODULE SYSTEMS IN SHORE AND HARBOR PROTECTION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W79-02201

SIMULATION MODEL OF CRYPTOMONAS OVATA POPULATION DYNAMICS IN SOUTHERN KOOTENAY LAKE, BRITISH COLUMBIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5C.
W79-02225

WIND INDUCED DISPERSION AND ALGAL GROWTH IN SHALLOW LAKES,
Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W79-02226

A PATTERN ANALYSIS OF CLEAR LAKE PHYTOPLANKTON,
California Univ., Berkeley Lawrence Berkeley Lab.
For primary bibliographic entry see Field 5C.
W79-02227

SEASONAL CHANGES IN THE EPIPHYTE COMMUNITY OF NATURAL AND ARTIFICIAL MACROPHYTES IN LAKE MEMPHREMAGOG (QUE. AND VT.),
McGill Univ. (Montreal). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-02232

RELEASE OF DISSOLVED ORGANIC CARBON BY GRAZING ZOOPLANKTON,
Frankfurt Univ. (West Germany). Fachbereich Biologie.
For primary bibliographic entry see Field 5C.
W79-02234

AN EVALUATION OF PHOSPHORUS-CHLOROPHYLL-PHYTOPLANKTON RELATIONSHIPS OF LAKES,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
For primary bibliographic entry see Field 5C.
W79-02247

MAXIMUM DEPTH INHABITED BY AQUATIC VASCULAR PLANTS,
Rensselaer Polytechnic Inst. Troy, NY. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-02249

RECENT CHANGES IN PLANKTON COMMUNITIES AND PRESENT TROPHIC STATE OF LAKE STEINSFJORD,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W79-02250

HYDROLOGIC BUDGET MODEL,
Florida University, Gainesville, Department of Environmental Engineering Sciences and Center for Wetlands.
F. C. Wang, and K. Heimburg.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 68-109, 1976. 17 fig, 15 tab.

Descriptors: *Swamps, *Model studies, *Hydrologic budget, *Wetlands, Hydrologic properties, Mathematical models, Water balance, Water table, Florida.

An equation is derived relating the water depth changes in cypress domes to the water budget components of the ecosystem. In this equation, all waters, surface and subsurface, entering or leaving a dome are included. The changes of dome water level exhibit the dynamics of surface and subsurface flows. The dome water level at the end of each month is taken as the sum of the previous month's water level and the water level change predicted for the equation during the month. The model has been calibrated for two different years and for three different domes. The water components are not exactly balanced, but are within the limit of accuracy of the collected data. (See also W79-02256) (Steiner-Mass)
W79-02258

STRATIGRAPHY AND HYDROGEOLOGIC CORRELATION STUDIES IN SEVERAL CYPRESS DOMES-NORTH CENTRAL FLORIDA,
Florida University, Gainesville, Department of Geology.
For primary bibliographic entry see Field 5E.
W79-02259

HYDROLOGY OF THE AUSTIN CARY CONTROL DOME,
Florida Univ., Gainesville. Dept. of Geology; and Florida Univ., Gainesville, FL. Center for Wetlands.
For primary bibliographic entry see Field 5E.
W79-02260

RADIATION STUDIES; CYPRESS WETLANDS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02261

SEASONAL CHANGES IN THE DISTRIBUTION OF WATER FERN AND DUCKWEED IN CYPRESS DOMES RECEIVING SEWAGE,
Florida Univ., Gainesville, School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02262

UPTAKE AND DISTRIBUTION OF PHOSPHORUS IN THE UNDERSTORY OF CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02264

LITTERFALL AND LITTER DECOMPOSITION IN FOUR CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02265

AIR EMISSIONS FROM CYPRESS SWAMPS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Science; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02266

THE RESPONSE OF BENTHIC INVERTEBRATE POPULATIONS TO SEWAGE ADDITION,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02267

COLIFORM MONITORING OF WATERS ASSOCIATED WITH THE CYPRESS DOME PROJECT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W79-02268

WATER QUALITY OF CYPRESS DOMES: ROUTINE SAMPLING PROGRAM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Scientific; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02269

DENITRIFICATION AND SURFACE RUNOFF IN THE EXPERIMENTAL DOMES: CYPRESS WETLANDS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Centre for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02270

RATES OF GROWTH AND NUTRIENT CONCENTRATIONS OF TREES IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5C.
W79-02271

GROWTH RATES OF SEEDLINGS PLANTED IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02272

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON GROWTH OF SURROUNDING PINE SEEDLINGS AND TREES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02274

SEDIMENTATION RATES: CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W79-02275

NITROGEN TRANSFORMATIONS IN WATER AND SEDIMENTS OF CYPRESS DOMES WITH AND WITHOUT ADDED SEWAGE EFFLUENT,
Florida Univ., Gainesville. Dept. of Soil Science.
J. E. Struble, and D. A. Graetz.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 517-539, 1976. 11 fig, 3 tab, 7 ref.

Descriptors: *Swamps, *Water pollution effects, *Denitrification, Wetlands, Florida, Waste water disposal, Sewage, Nutrients, Nitrogen, Nitrates, Groundwater, Ammonia, Percolation.

The NH4-N and NO3-N levels entering cypress domes receiving sewage effluent was in the range of 4 and 10 ppm N, respectively, while the water entering another dome receiving groundwater had less than 1 ppm NH4-N or NO3-N. The NH4 and NO3 may be taken up by the vegetation of the dome. Part of the NO3 that is present in the water may diffuse into the sediment layer. Once in contact with the active layer of sediment, the NO3 may be converted to N20 or N2 gas through denitrification reactions. The denitrification reactions in the sediments are important for the removal of NO3 entering the groundwater. As water percolates, the NH4 remaining in the water may be absorbed to the cation exchange sites on the organic matter in the sediments. But as these sites reach maximum adsorption, the excess NH4 may percolate through the dome. (See also W79-02256)(Steiner-Mass)
W79-02276

COMPARATIVE STUDIES OF CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environemental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
S. Brown.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 540-560, 1976. 8 fig, 5 tab.

Descriptors: *Swamps, *Productivity, *Photosynthesis, Nutrients, Fertilization, Florida, Respiration.

Measurements of photosynthesis, respiration, and litterfall of cypress dome ecosystems were made to determine what effects the hydrologic and nutrient cycles have on these systems' productivity. The results are presented for each and the domes measured and a few comparisons are made. The data indicates that increased fertility produces increased productivity in cypress domes. (See also W79-02256)(Steiner-Mass)
W79-02277

DISTRIBUTION OF CHLOROPHYLL IN CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02278

THE EFFECTS OF PERTURBATION ON CYPRESS DOME ANIMAL COMMUNITIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02279

COMPARISON OF FALL BIRDS PRESENT IN A NATURAL CYPRESS DOME, AND THE ADJACENT PINE PLANTATION,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02280

PROGRESS REPOT ON MOSQUITOE RESEARCH: CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Entomology and Nematology; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5G.
W79-02281

ECOSYSTEM ANALYSES AT CORKSCREW SWAMP,
National Audubon Society, New York.
For primary bibliographic entry see Field 2I.
W79-02282

ACCELERATING SECONDARY SUCCESSION IN CYPRESS STRANDS,
Florida Univ., Gainesville. Dept. of Botany; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02283

THE ORGANIC SEDIMENTS OF CORKSCREW SWAMP SANCTUARY,
Central and Southern Florida Flood Control District, West Palm Beach, FL.
P. A. Stone, and P. J. Gleason.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 763-771, 1976. 2 tab, 6 ref.

Descriptors: *Swamps, *Peat, *Cores, Wetlands, Florida, Marshes, Nitrogen, Oxygen, Muck soils.

The deposit of organic sediment, principally peat, found at Corkscrew Swamp Sanctuary is occupied by two dissimilar plant communities, an open marsh consisting of graminoid vegetation and a mature cypress swamp dominated by large bald cypress trees. Compared to Everglades peat, Corkscrew Swamp peats are more degraded with less plant material retaining indentifiable tissue structure which is indicative of a poorer preserving environment, possibly a shorter hypoperiod, or deeper zone of aeration. On a moisture-free basis, nitrogen decreases with depth. Oxygen decreases and sulfur increases with depth, except for the bottom sample. The bottom sample may represent a different parent material (plant community) or differing preserving environment, for it is adjacent to calcareous sediments. (See also W79-02256)(Steiner-Mass)
W79-02284

DISSOLVED HYDROGEN SULFIDE IN SOIL WATER IN SAN FELASCO HAMMOCK AND DEERHAVEN CYPRESS DOME,
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5B.
W79-02285

CYPRESS GROWTH RESPONSE IN A SEWAGE-ENRICHED POND CYPRESS ECOSYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02287

A PALEOLIMNOLOGICAL COMPARISON OF BURNTSIDE AND SHAGAWA LAKES, NORTHEASTERN MINNESOTA,
Geological Survey, Denver, CO.
For primary bibliographic entry see Field 5C.
W79-02295

IDENTIFICATION AND DELINEATION OF FRESHWATER WETLAND VALUES,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 6B.
W79-02402

THE RELEASE OF PLANT NUTRIENTS FROM REED BORDERS AND ITS TRANSPORT INTO THE OPEN WATERS OF THE BODENSEE-UNTERSEE, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W79-02422

INVESTIGATION OF THE MICROFLORA OF SWAMP ORE AND LAKE WATER BY THE METHOD OF ELECTRON MICROSCOPY, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W79-02423

THE EFFECT OF DRAWDOWN DATE ON WETLAND PLANT SUCCESSION,
Winous Point Club, Port Clinton, Ohio.
For primary bibliographic entry see Field 2I.
W79-02424

THE VEGETATION OF SOUTHERN FLORIDA,
University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W79-02425

NUTRIENTS IN SUBSURFACE AND RUNOFF WATERS OF THE HOLLAND MARSH, ONTARIO,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 5C.
W79-02428

ORGANOCHLORINE AND MERCURY RESIDUES IN FISH FROM LAKE SIMCOE, ONTARIO 1970-76,
Ontario Ministry of Agriculture and Food, Guelph. Pesticide Residue Lab.
For primary bibliographic entry see Field 5B.
W79-02456

THE CRUSTACEAN ZOOPLANKTON OF GRASMERE BEFORE AND AFTER A CHANGE IN SEWAGE EFFLUENT TREATMENT,
Freshwater Biological Association, Ambleside, (England).
For primary bibliographic entry see Field 5C.
W79-02458

2I. Water In Plants

THE NATURE OF GROWTH FORMS IN THE SALT MARSH GRASS SPARTINA ALTERNIFLORA,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 2L.
W79-02087

DO TIDES AFFECT COASTAL INSECT COMMUNITIES,
Houston Univ., TX. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W79-02089

VEGETATION CHANGES IN A SMALL MICHIGAN BOG FROM 1917 TO 1972,
Michigan Univ., Pellston. Biological Station.
For primary bibliographic entry see Field 2H.
W79-02091

THE DISTRIBUTION OF JUNCUS ROEMERIANUS IN THE SALT MARSHES OF NORTH AMERICA,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 2L.
W79-02093

AQUATIC INVERTEBRATE ABUNDANCE IN RELATION TO CHANGING MARSH VEGETATION,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 2H.
W79-02095

GEOGRAPHIC VARIATIONS IN SALT MARSH MACROPHYTE PRODUCTIONS: A REVIEW,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
For primary bibliographic entry see Field 2H.
W79-02098

ROOT PRODUCTION AND ROOT TURNOVER IN A WET TUNDRA ECOSYSTEM, BARROW, ALASKA,
Duke Univ., Durham, NC. Dept. of Botany.
G. R. Sharer, and W. D. Billings.
Ecology, Vol. 56, No. 2, p 401-409, Early Spring, 1975. 8 fig, 4 tab, 22 ref.

Descriptors: *Root systems, *Primary productivity, *Tundra, *Turnovers, Ecosystems, *Alaska, Wetlands, Seasonal, Biomass, Root distribution, Tiller systems.

The wet tundra near Barrow, Alaska, is dominated by three species of graminoids: Dupontia fischeri, Carex aquatilis, and Eriophorum angustifolium. Root production, turnover, and distribution patterns were studied by direct observation of growing roots and by analysis of whole, interconnected tiller systems dug from the soil. Root weight per unit length and density of individual tillers were also measured in the field. Production of new roots was found to be strongly correlated with age of individual tillers, each species having a distinctive growth pattern and phenology. Root turnover rates varied considerably ranging from an annual turnover in E. angustifolium to 6-8 or possibly 10 years in C. aquatilis. An estimate of root turnover on an ecosystem basis is about 100 g/sq m/yr, or 25% of the live root biomass. Species with the shallowest and longest lived roots have the greatest weight per unit length of root, and vicer versa. Each species has a characteristic root distribution pattern with depth and in relation to the progress of soil thaw. (Stihler-Mass)
W79-02100

BIOCHEMICAL AND TRANSPIRATION STUDIES OF THE GROWTH FORM OF SPARTINA ALTERNIFLORA ON CONNECTICUT SALT MARSHES,
Connecticut Coll., New London. Dept. of Botany.
M. L. Shea, R. S. Warren, and W. A. Niering.
Ecology, Vol. 56, No. 2, p 461-466, Early Spring, 1975. 8 fig, 18 ref.

Descriptors: *Rooted aquatic plants, *Adaptation, *Plant morphology, *Salt marshes, *Connecticut, Coastal marshes, Ecotypes, Intertidal areas, Environmental effects, Plant growth, *Spartina alterniflora.

In southern New England Spartina alterniflora occurs as a tall grass (1.25-2 m) within the intertidal zone and as a short form (0.3-0.4 m) within pannes on the high marsh. By means of electrophoretic comparisons of total soluble proteins and selected enzymes, along with reciprocal field transplants, an attempt was made to clarify the ecotype versus ecophene status of these different forms. All data obtained suggest that the tall and short forms are genetically indistinguishable and therefore merely reflect physiological responses to the environmental differences between the inter-tidal and panne sites.
W79-02101

THE AUTECOLOGY OF SAWGRASS IN THE FLORIDA EVERGLADES,
Agricultural Research Service, Fort Lauderdale, FL. Southern Region.
For primary bibliographic entry see Field 2L.
W79-02104

ANGIOSPERM PRODUCTION OF THREE VIRGINIA MARSHES IN VARIOUS SALINITY AND SOIL NUTRIENT REGIMES,
Virginia Inst. of Marine Science, Gloucester Point, VA.
For primary bibliographic entry see Field 2L.
W79-02108

AN ATLAS OF VASCULAR PLANT SPECIES DISTRIBUTION MAPS FOR TIDEWATER MARYLAND,
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
W. S. Sipple.
Wetland Publication No. 1, April, 1978. 280 p, 231 fig, 24 ref, 1 append.

Descriptors: *Marsh plants, *Mapping, *Distribution patterns, *Maryland, Wetlands, Coastal marshes, Tidal marshes, Salt marshes, Marshes, Swamps, *Maps.

The locations of 238 species of strand, submerged aquatic, and tidal wetland vascular plants are mapped along the Maryland coast. Species distribution maps are divided into three general categories: strand, marsh, and swamp plants. Strand plants include those that are usually found on beaches, dunes, spits, overwash berms, and similar habitats. Marsh plants are divided further into freshwater and brackish marsh groups and the swamp types into shrub swamp and swamp forest groups. (Steiner-Mass)
W79-02109

A REVIEW OF THE BIOLOGY, ECOLOGY, AND MANAGEMENT OF SCIRPUS OLNEYI, VOLUME I: AN ANNOTATED BIBLIOGRAPHY OF SELECTED REFERENCES,
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
W. S. Sipple.
Wetland Publication No. 2, May, 1978. 96 p, 180 ref.

Descriptors: *Bibliographies, *Bulrushes, Abstracts, Marsh plants, Rooted aquatic plants, Monocots, Reviews.

A bibliography of 158 annotated and 22 additional, non-annotated references are listed and indexed. The key word/phase index contains 192 key words listed under 13 categories: anatomy, distribution, ecology, genetics, growth and development, impact of or use by, management, morphology, ontogeny, physiology or chemical composition, reproduction, soil, and taxonomy. (Steiner-Mass)
W79-02110

A BIBLIOGRAPHY OF MARYLAND'S TIDAL WETLANDS (MARSHES-SWAMPS),
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
For primary bibliographic entry see Field 2L.
W79-02111

APPARENT USE OF SEDIMENT NITROGEN AND PHORPHORUS BY PLANTS IN MALLETTS CREEK MARSH WITH IMPLICA-

TIONS TO LAKE CHAMPLAIN WATER LEVEL REGULATION,
Geological Survey, Albany, NY.
For primary bibliographic entry see Field 2H.
W79-02115

SIMULATED FLOW THROUGH THE ROOT XYLEM,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Soils and Crops.
W. J. Busscher, and D. D. Fritton.
Soil Science, Vol. 125, No. 1, p 1-6, January, 1978. 5 fig, 14 ref. 5 eau.

Descriptors: *Xylem, *Root systems, *Flow resistance, Flow rates, *Simulation analysis, Model studies, Water pressure, Evapotranspiration.

Flow through the xylem of a complex root system is simulated to measure xylem resistance to water flow, and to determine whether or not this resistance is significant. Equations are set up that model xylem water flow as if it were flow through thin tubes. The root characteristics needed to solve these equations are obtained from an earlier work. Xylem water flow is first considered for a single main root and its laterals. It decreases with age of the root or increase of root length, and it increases with the addition of laterals. The advantage of an increasing number of main roots is also shown. Finally, flow through the plant crown is compared to Thornthwaite and Blaney-Criddle evapotranspirational estimates. Less than 10 millibars of water pressure is needed to overcome xylem resistance, and, therefore, the resistance is considered negligible. (Skogerboe-Colorado State)
W79-02199

CYPRESS WETLANDS FOR WATER MANAGEMENT, RECYCLING AND CONSERVATION (THIRD ANNUAL REPORT, NOVEMBER 1, 1975 TO DECEMBER 15, 1976),
Florida Univ., Gainesville. Center for Wetlands.
H. T. Odum, K. C. Ewel, J. W. Ordway, and M. K. Johnston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 097, Price codes: A99 in paper copy, A01 in microfidhe. Report NSF/RA-760508, 1976. 879 p.

Descriptors: *Swamps, *Nutrients, *Productivity, *Model studies, Wetlands, Florida, Sewage, Cycling nutrients, Bacteria, Marsh plants, Mosquitoes, Marsh management, Forest management, Invertebrates.

Studies of water budget and geology show how cypress domes store and save water compared to reservoirs. Experiments with recycling treated sewage water show that the cypress basins (domes) filter nutrients, microbes, heavy metals, and virus, improving the water as the sewage water recharges groundwater. Measurements and systems models show budgets of phosphorus, nitrogen, and carbon, and the role of trees, shrubs, sediments, duckweed, and sedimentation in processing materials, productivity, total metabolism, and building ecological patterns. Comparisons are made with strands and floodplains. Regional studies consider the quantitative role of swamps in water and nutrient budgets of four counties and the south Florida region. Detailed studies include measurements of encephalitus virus and mosquitoes, indices of insect abundance, chlorophyll, seedlings, litter, decomposition rates and soil characteristics. Engineering costs for swamps to serve in place of tertiary treatment are low. The report includes results of 14 phases, a report of the Center for Wetlands and auxiliary projects, report of a workshop, report on these, and publications, and summaries. (See W79-02257 thru W79-02287) (Steiner-Mass)
W79-02256

RADIATION STUDIES: CYPRESS WETLANDS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
K. Heimburg.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p. 157-162, 1976. 1 fig, 1 tab, 2 ref.

Descriptors: *Swamps, *Light penetration, *Climates, Wetlands, Light intensity, Aquatic environment, Light.

Spectral measurements show that cypress canopy does not significantly change the quality of sunlight reaching the bottom of the dome from that incident at the top; it just reduces its itensity. Too few measurements of the reflection spectrum have been made to allow identification of a characteristic cypress spectrum or comparison to reflection spectra of other vegetation types. Meteorologic data indicate that climate inside the domes is ameliorated substantially by the presence of water vapor; during the day it is slightly cooler in the dome than outside it, and the reverse is true at night. The fluctuations in water temperature are much smaller in a duckweed covered dome, an environmental factor that may be important to decomposition processes taking place in the water. (See also W79-02256) (Steiner-Mass)
W79-02261

SEASONAL CHANGES IN THE DISTRIBUTION OF WATER FERN AND DUCKWEED IN CYPRESS DOMES RECEIVING SEWAGE,
Florida Univ., Gainesville, School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
K. C. Ewel.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville p. 164-170, 1976. 2 fig, 1 tab, 2 ref.

Descriptors: *Swamps, *Floating plant, *Ferns, *Annual succession, Wetlands, Florida, Aquatic plants, Marsh plants, Distribution patterns, Cycling nutrients.

During the spring, summer, and fall, the nonrooted, floating plant cover in two cypress domes which had been receiving secondarily treated sewage consisted almost entirely of two duckweed species, Lemna perpusilla and Spirodela aligorhiza. Small patches of Azolla caroliniana, a small floating water fern, was also found, usually associated with a patch of emergent vegetation. There were no floating plants on the surface of the central area of a cypress dome which has had groundwater pumped into it weekly, although both Lemna and Azolla are common around the edge. Only Lemna and Spirodela are found on the undisturbed dome. During the winter, Azolla increased its percentage of coverage in both domes significantly. This change may be due primarily to a change in light intensity. Considering both the nitrogen-fixing ability of Azolla and the dependence of Lemana on a nitrate source, the shift in species composition may clearly hve important consequence on the nutrient cycling role played by the plants. (See also W79-02256) (Steiner-Mass)
W79-02262

CHANGES IN UNDERSTORY VEGETATION IN CYPRESS DOMES BROUGHT ABOUT BY FIRE AND ADDITION OF SEWAGE,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02263

UPTAKE AND DISTRIBUTION OF PHOSPHORUS IN THE UNDERSTORY OF CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02264

LITTERFALL AND LITTER DECOMPOSITION IN FOUR CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
G. Deghi.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p. 197-231, 1976. 15 fig, 3 tab, 1 ref.

Descriptors: *Swamps, *Leaves, *Productivity, Wetlands, Florida, Burning, Canopy, Deciduous trees, Trees.

In two unburned cypress domes, the fastest litterfall rate occurred in November while the peak was delayed until December in two burned domes. Hardwood litterfall peaks occur prior to the peaks of cypress needles, and the earlier peaks of total litterfall in the two unburned domes are presumably due to the lack of hardwoods, primarily blakgum, in the canopy of the burned domes. Large wood accounts for a much larger percentage of the annual litterfall in the burned domes. Because of the fire, there is much dead above-ground organic matter which blows over in the winter when high winds accompany frontal storms. The cumulative total litterfall was 199 and 480 g/sq m/ year for the unburned domes. Large increases in normal litterfall were exhibited by the two burned domes in the second year of the study, 461 and 811 g/sq m/year, respectively. This increase suggests recovery from burning. Little change in tree diameters has been reported in most of the domes; thus, productivity is manifested in litterfall and the cumulative annual litterfall may provide an estimate of net production. (See also W79-02256) (Steiner-Mass)
W79-02265

AIR EMISSIONS FROM CYPRESS SWAMPS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Science; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02266

THE RESPONSE OF BENTHIC INVERTEBRATE POPULATIONS TO SEWAGE ADDITION,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02267

RATES OF GROWTH AND NUTRIENT CONCENTRATIONS OF TREES IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5C.
W79-02271

GROWTH RATES OF SEEDLINGS PLANTED IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02272

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON SURROUNDING SOIL MOISTURE AND NUTRIENT CONTENT AND ON GROWTH OF PINE TREES (SUMMARY OF MS THESIS),
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02273

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON GROWTH OF SURROUNDING PINE SEEDLINGS AND TREES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02274

COMPARATIVE STUDIES OF CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environemental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2H.
W79-02277

DISTRIBUTION OF CHLOROPHYLL IN CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
S. Brown, and J. Truelson.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 561-576, 1976. 3 fig, 3 tab, 5 ref.

Descriptors: *Swamps, *Florida, *Chlorophyll, Wetlands, Plant pigments, Trees, Photosynthesis, Plant physiology.

In most of the cypress leaves measured, especially those in the top canopy levels, the chlorophyll a content was two to three times the maximum range level of most plants. The results expressed on a mg chlorophyll/g of leaf dry weight show that in general the lower down in the forest canopy the leaves, the greater the concentration of chlorophyll a. This may represent shade adaptation in the leaves in response to lower light levels. The chlorophyll a to b ratio was 1-1.5 for the cypress leaves compared to a normal ratio of 2-3 for most plants. The less fertile cypress domes showed fewer chlorophyll differences than the more fertile sites. (See also W79-02256)(Steiner-Mass)
W79-02278

COMPARISON OF FALL BIRDS PRESENT IN A NATURAL CYPRESS DOME, AND THE ADJACENT PINE PLANTATION,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02280

PROGRESS REPOT ON MOSQUITOE RESEARCH: CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Entomology and Nematology; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5G.
W79-02281

ECOSYSTEM ANALYSES AT CORKSCREW SWAMP,
National Audubon Society, New York.
M. J. Duever, J. E. Carlson, L. A. Riopelle, L. H. Gunderson, and L. C. Duever.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 707-737, 1976. 9 fig, 5 tab, 4 ref.

Descriptors: *Swamps, *Florida, *Regional analysis, Wetlands, Freshwater marshes, Productivity, Soils, Vegetation, Grazing.

A report is given on the progress of field work being done on the Corkscrew Swamp Sanctuary, Florida. Factors being measured include the soil, watershed, marsh productivity, cypress biomass and DBH, cypress bole production, vegetation types, and the effects of cattle grazing. (See also W79-02256) (Steiner-Mass)
W79-02282

ACCELERATING SECONDARY SUCCESSION IN CYPRESS STRANDS,
Florida Univ., Gainesville. Dept. of Botany; and Florida Univ., Gainesville. Center for Wetlands.
L. Gunderson.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 738-762, 1976. 2 fig, 10 tab, 7 ref, 1 append.

Descriptors: *Swamps, *Vegetation regrowth, *Forest management, Wetlands, Florida, Trees, Revegetation, Lumbering, Burning, Seeds, Germination.

Seeds and seedlings of cypress were planted into seral stages following logging, burning, and logging-and-burning, to test the successional stage at which cypress invades most successfully. Of the seedlings transplanted, 78% survived. No difference in seedling mortality among sites was noticed. Survival of seedlings in cleaned areas was not different from that of seedlings growing among the existing vegetation. Average seed germination was less than 3% at all sites. The critical factors in cypress regeneration seem to be available seed source and proper water requirements for germination and survival. Once seed sources are removed, regrowth can be slow. Cypress regrowth may be slower than other logged forests due to limited mobility of the seeds. A few seed sources were present at the logged and the burned sites. Regeneration is occurring at these sites and is probably retarded by the moisture requirements. No cypress regeneration was noticed at the logged-and-burned site. (See also W79-02256) (Steiner-Mass)
W79-02283

DESIGN AND THE DESERT ENVIRONMENT: LANDSCAPE ARCHITECTURE IN THE AMERICAN SOUTHWEST,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 3B.
W79-02389

EARTHQUAKE-INITIATED CHANGES IN THE NESTING HABITAT OF THE DUSKY CANADA GOOSE,
Rutgers - The State Univ., Newark, NJ. Dept. of Botany.
J. H. Crow.
The Great Alaska Earthquake of 1964: Biology. National Academy of Sciences, Washington, D.C. 1971. p 130-136. 3 fig, 2 tab, 12 ref.

Descriptors: *Alaska, *Marsh plants, *Distribution patterns, *Earthquakes, *Canada goose, *Nesting cover, Wetlands, Salt marshes, Grasses, Marshes, Coastal marshes, Waterfowl, Wildlife habitat.

The dusky Canada goose nests in a restricted part of the Copper River delta occupied by a plant community characterized by Hedysarum alpinum americanum and Deschampsia beringensis. This vegetation flourishes in the slightly saline soils at the tops of channel banks, where before the earthquake it was inundated by diluted seawater during occasional storm tides. As a result of uplift during the earthquake, however, the pre-earthquake channel-bank vegetation and the interchannel areas are no longer reached by even the highest tides, and the soil is being rapidly desalinized. Drier conditions and the removal of salt permit invasion of the Hedysarum-Deschampsia belt by plants characteristic of other belts, and hence the favored nesting habitat of the goose is deteriorating. Presumably the Hedysarum-Deschampsia community will eventually reestablish itself at a lower level on the tidal flats, but the area available is expected to be smaller than the area occupied at present. Over the years the dusky Canada goose will find progressively more restricted nesting grounds, which will lead to a reduction in its numbers unless it can adapt to other kinds of vegetation. (Steiner-Mass)
W79-02416

DIURNAL USE OF SMALL WETLANDS BY DUCKS,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
A. T. Klett, and L. M. Kirsch.
Journal of Wildlife Management, Vol 40, No 2, p 351-353, April, 1976. 1 tab, 11 ref.

Descriptors: *Ducks, *Blue-winged teal, *Wetlands, *North Dakota, Habitats, Waterfowl, Ponds, Diurnal.

In 1969 morning and afternoon counts of ducks using 43 small wetlands in east-central North Dakota were made; in 1970 morning, afternoon, and evening counts were made. These wetlands were typically shallow and devoid of emergent cover except for a narrow marginal band. Peak use by Blue-winged Teal occurred in the early morning and evening especially during the period when most birds were observed as segregated pairs. Observations of species other than Blue-winged Teal were too few to determine changes in the use of these wetlands. (Stihler-Mass)
W79-02418

PRODUCTION OF SUBMERGED AQUATIC PLANT COMMUNITIES OF DOODHADHARI LAKE RAIPUR, (M. P. INDIA),
Government Post Graduate Coll., Chhindware (India). Dept. of Botany.
K. S. Unni.
Hydrobiologia, Vol. 48, No. 2, p 175-177, February 29, 1976. 2 tab, 16 ref.

Descriptors: *Primary productivity, *Submerged plants, *Lakes, Wetlands, Aquatic plants, Rooted aquatic plants, Biomass, Doodhadhari Lake(India).

The biomass of submerged aquatic plant communities was studied periodically during the two annual growth periods of one year. Najas minor contributed 78% to the total standing biomass. Ceratophyllum dermersum, Hydrilla spp., Nelumbo nucifera, Trapa bispinosa, and Potamogeton crispus contributed towards the remaining biomass. Production, as calculated by the difference between initial and final biomass, was 0.64 g/sq m/day for the growing seasons. (Stihler-Mass)
W79-02419

AQUATIC VASCULAR PLANTS OF LAKE APOPKA, FLORIDA,
Georgia Coll., Nilledgeville. Inst. of Natural Resources.
T. L. Chesnut, and E. H. Barman, Jr.
Florida Scientist, Vol. 37, No. 1, p 60-64, Winter, 1974. 1 tab, 7 ref.

Descriptors: *Aquatic plants, *Florida, *Lakes, *Lake Apopka(Fla), Rooted aquatic plants, Floating plants, Submerged plants, Algae, Water hyacinths, Eutrophication, Wetlands.

Emergent plants are abundant around most of Lake Apopka's perimeter. Water hyacinth, the most common plant present, has increased in abundance since the vegetation was surveyed in the early 1960's. Massive algal blooms, resulting from advanced eutrophication, have shaded out bottom dwelling plants. (Stihler-Mass)
W79-02420

THE EFFECT OF DRAWDOWN DATE ON WETLAND PLANT SUCCESSION,
Winous Point Club, Port Clinton, Ohio.
R. L. Meeks.
Journal of Wildlife Management, Vol. 33(4), p 817-821, October, 1969, 1 tab, 8 ref.

Descriptors: *Marsh plants, *Succession, *Drawdown, Wetlands, Wildlife habitats, Ohio, Freshwater marshes, Marshes, Water levels.

An 80-acre marsh was diked into four units, one of which was drained yearly in mid-March, one in mid-April, and one in mid-May, and one in mid-June. All of the units were reflooded during September. Plant succession followed the same general trend on all units, going from semi-aquatic species to predominantly annual weeds. Fewer years were required with early drawdowns for annual weeds to replace semi-aquatic species. The May drawdown unit had the best plant associations for wildlife after seven seasons. (Steiner-Mass)
W79-02424

THE VEGETATION OF SOUTHERN FLORIDA,
University of South Florida, Tampa. Dept. of Biol-

ogy.
R. W. Long.
Florida Scientist, Vol. 37, No. 1, p 33-45, Winter 1974. 6 fig, 1 tab, 19 ref.

Descriptors: *Florida, *Vegetation, *Plant populations, Aquatic plants, Wetlands, Mangroves, Marshes, Salt marshes, Rivers, Marine plants, Dunes, Pine trees, The Everglades, Big Cypress Swamp, Atlantic Coastal Ridge.

Five physiographic provinces are recognized for this area: Sandy Flatwoods, the Everglades, Big Cypress Swamp, the Atlantic Coastal Ridge, and the Coastal Marshes and Mangrove Swamps. Principal plant associations in southern Florida are: Scrub Vegetation, Hardwood Hammocks occurring in the Everglades, Fresh Water Swamps flooded by shallow water throughout most of the year, Dry Pineland, Wet Pineland occurring on seasonally flooded low areas, Mangroves, Salt Marsh, Wet Prairies dominated by Saw Grass, Dry Prairies, Coastal Strand, Ruderal, Aquatic and Marsh Communities, and Marine Communities including dense submarine meadows. There are 1647 species of vascular plants in this area; 60.6% are of tropical origin. Approximately 10% of the total flora are endemic, and most of these appear to be related to the temperate Appalachian flora. (Stihler-Mass)
W79-02425

PHYSIOLOGICAL ASPECTS OF WATER USE EFFICIENCY,
Nebraska Univ., Lincoln. Dept. of Agronomy.
C. Y. Sullivan, J. D. Easton, J. M. Bennett, and N. V. Norcio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 344, Price codes: A04 in paper copy, A01 in microfiche. Nebraska Water Resources Center, The University of Nebraska, Project Completion Report, 1978. 57 p, 6 fig, 3 tab, 11 ref. OWRT A-044-NEB(1). 14-34-0001-8029.

Descriptors: *Water use efficiency, *Sorghum, *Water stress, *Water utilization, Drought tolerance, *Photosynthesis, Root systems, Leaves, Osmotic pressure, Turgor potential, *Plant physiology.

Grain sorghum plants growing in hydroponic cultures in a greenhouse were subjected to various levels of water stress by the addition of polyethylene glycol to the nutrient solutions. Several physiological parameters, including net photosynthesis, leaf diffusive resistance, leaf water, osmotic and turgor potentials were measured before, during and after the stress periods. In addition, total grain yield, number of seeds per plant, total dry weight, plant height, stover weight, root weight and length, and water use efficiency were determined for each treatment. Plant conditioning or hardening to drought stress was examined by monitoring photosynthesis of plants which had previously been exposed to a preconditioning stress. It was concluded that plants which had been subjected to a preconditioning stress could better withstand and recover from a later more severe water deficit. This conditioning response is probably a result of both physical and biochemical changes which occur within the plant. The conditioning response was also dependent on genotype. In other experiments it was shown that sorghums could grow well with only a small portion of their total root systems in contact with nutrient water. It is suggested that selection for sorghum genotypes with a few penetrating roots with high water absorption capacity would increase water use efficiency.
W79-02449

2J. Erosion and Sedimentation

GRADIENT, DISCHARGE, AND PARTICLE-SIZE RELATIONS OF ALLUVIAL CHANNELS IN KANSAS, WITH OBSERVATIONS ON BRAIDING,
Geological Survey, Lawrence, KS. Water Resources Div.
W. R. Osterkamp.
American Journal of Science, Vol 278, p 1253-1268, November 1978. 5 fig, 3 tab, 16 ref.

Descriptors: *Gradients(Streams), *Alluvial channels, *Average flow, *Bottom sediments, *Particle size, *Kansas, Streams, Sediment transport, Meanders, Braiding, Beds, Bed material, Power-function equations.

Gradient, mean-discharge, and bed-material-size data were compiled for 76 alluvial streams of Kansas. A series of functional analyses of the data demonstrates that groupings based on median particle size and sorting of bed material are better than groupings based on channel pattern or sinuosity. Data collected suggest that particle sizes of bed material affect braided channels in a similar manner as for nonbraided streams. Consideration of conditions conductive to braiding indicate the possibility that lower limits for gradient can be defined for braided streams of specified mean-discharge and bed-material characteristics. (Woodard-USGS)
W79-02120

SEDIMENTATION IN HOT CREEK IN VICINITY OF HOT CREEK FISH HATCHERY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
D. E. Burkham.
Available from OFSS Branch of Distribution USGS, Box 25425, Fed. Ctr., Denver, CO. 80225; Microfiche $4.00, Paper copy $1.75. Open-file report 78-661, August 1978. 9 p, 1 fig, 9 ref.

Descriptors: *Sedimentation, *Fluvial sediments, *Streams, *Environmental effects, *Trout, Sediment transport, *California, Mono County(CA), *Hot Creek.

An accumulation of fine-grained sediment in Hot Creek downstream from Hot Creek Fish Hatchery, Mono County, Calif., created concern that the site may be deteriorating as a habitat for trout. The accumulation is a phenomenon that probably occurs naturally in the problem reach. Fluctuation in the weather probably is the basic cause of the deposition of fine-grained sediment that has occurred since about 1970. Man's activities and the Hot Creek Fish Hatchery may have contributed to the problem; the significance of these factors, however, probably was magnified because of drought conditions in 1975-77. (Woodard-USGS)
W79-02128

A CONTRIBUTION TO THE LAKE PLEISTOCENE STRATIGRAPHY OF THE SUSQUEHANNA RIVER VALLEY OF NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
A. D. Randall.
Empire State Geogram, Vol 14, No 2, p 1-15, 1978. 2 fig, 2 tab, 15 ref.

Descriptors: *Stratigraphy, *Sediment transport, *Particle size, *Geologic formations, River basins, Valleys, Glaciers, Ice, Melt water, Geologic history, Evaluation, *New York, *Susquehanna River basin(NY), *Late Pleistocene, *Stratified drift.

Local variations in erratic-pebble content of stratified drift in parts of the Susquehanna River basin in New York are comparable in magnitude to regional variations described in the literature. Along the Susquehanna valley west of Binghamton, older stratified drift in any locality contains very few erratic pebbles in comparison with younger deposits. Extensive terraces are capped by 'bright' gravel, in which 30 to 50 percent of the pebbles are of erratic lithologies; the terraces are underlain and locally bordered by 'drab' gravel and sand in which 85 to nearly 100 percent of the pebbles consist of local shale and siltstone. Any till beneath the stratified drift is drab. These relationships are useful in local subsurface correlation. The stratified drift was deposited during a single deglaciation in which melt-water streams probably extended a few tens of miles through stagnant and active ice; these streams may have played a major role in transporting erratic material southward. (Woodard-USGS)
W79-02135

DISTRIBUTION OF SURFICIAL SEDIMENTS AND EELGRASS IN NEW YORK'S SOUTH SHORE BAYS: AN ASSESSMENT FROM THE LITERATURE,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W79-02162

TRANSPORTATION AND ACCUMULATION OF FINE-GRAINED SEDIMENTS IN THE ESTUARINE ENVIRONMENT: RECOMMENDATIONS FOR RESEARCH,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W79-02165

SUBSURFACE GEOLOGICAL INVESTIGATION OF A PLEISTOCENE BRAIDED STREAM IN THE NORTHERN COASTAL PLAIN, DELAWARE (U.S.A.),
Delaware Geological Survey, Newark.
N. Spoljaric.
Sedimentology, Vol. 21, p 451-461, 1974, 3 fig, 17 ref. OWRT B-002-DEL(4).

Descriptors: *Braiding, *Channel morphology, *Facies(Sedimentary), *Fluvial sediments, *Sedimentary structures, Texture, *Coastal plains, Fluvial depositional environments, Subsurface primary sedimentary structures, Textural sedimentary parameters, Northern Atlantic Coastal Plain, *Delaware.

Primary sedimentary structures and sedimentary textures of the Pleistocene fluvial sediments of the Columbia Formation were investigated both in the outcrops and in the subsurface. Unknown sedimentary structures were recognized in the subsurface by correlating some textural parameters (mean grain size, skewness, and kurtosis) of the drilling (subsurface) samples with those of the outcrop samples where the sedimentary structures were known. The utilization of both the sedimentary structures were known. The utilization of both the sedimentary structures and the textures made it possible to recognize major morphologic elements of a Pleistocene stream system (channels, channel bars, floodbasins, and channel-fills) in the subsurface and to reconstruct, in a general way, the events that occurred during the existence of the stream system. Although the technique of the recognition of primary sedimentary structures in the subsurface employed in this study has been useful in the interpretation of the fluvial sedimentary bodies, it needs further testing before it can be accepted as a new geologic tool.
W79-02167

TRACE ELEMENT OF THE SARDIS RESERVOIR, MISSISSIPPI, AS RELATED TO CLAY MINERAL DISPERSION,
Mississippi Univ., University. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 2H.
W79-02187

STRUCTURAL CONTROL OF THE RAPIDS AND POOLS OF THE COLORADO RIVER IN THE GRAND CANYON,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2E.
W79-02200

COMPUTATION OF THE CONCENTRATION OF SUBSTANCES IN RIVERS AND CANALS,
For primary bibliographic entry see Field 5B.
W79-02206

MECHANISM OF FORMATION AND FORECAST OF THE DEVELOPMENT OF THE VOLGA DELTA,
R. I. Selivanov.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 55-60, 1977. 5 fig, 1 tab, 24 ref. Translated from News of the All-Union Geographic Society (Izvestiya VGO), Vol. 109, No. 1, p 47-55, 1977.

Descriptors: *Deltas, *Geomorphology, *Alluvial fans, *Forecasting, Rivers, Alluvial channels, Sedimentology, Erosion, On-site investigations, Surveys, Analysis, Sediments, Sediment discharge, Foreign research, Foreign countries, *USSR, *Volga River(USSR), *Caspian Sea.

The Volga delta is a very dynamic geomorphological formation. In the last 50-60 years, its active part has increased by approximately 1/3 of its initial size. Two major processes participate in the advance of the front edge of the Volga delta: sediment accumulation and changes in sea level. It was shown that the Volga delta will advance almost 5 km in 25 years under high-flow conditions, and its front edge will grow 9 km under moderate flow conditions. With runoff of 75% probability, which corresponds approximately to the present inflow into the sea, the delta will move 11 km. The Volga delta can be preserved in approximately its present state only if the Caspian Sea level remains stationary and flow is moderate. Redistribution of liquid runoff and sediment discharge in the delta will affect navigation conditions. Navigation will cease in many eastern arms if their channels are not deepened and cleaned. With a sharp advance of the delta by the year 2000, it will be necessary to increase the length of the Volga-Caspian Canal by no less than 40-50 km, and the volume of dredging work will increase. (Humphreys-ISWS)
W79-02210

THE DISTRIBUTION AND FORM OF PHOSPHORUS IN NORTH ATLANTIC OCEAN DEEP-SEA AND CONTINENTAL SLOPE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 5B.
W79-02230

SEDIMENTATION RATES: CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W79-02275

LAND USE AND INTENSIVE RANGE MANAGEMENT IN THE SIERRA NEVADA FOOTHILLS--A CONTEMPORARY ANALYSIS,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 4D.
W79-02293

SHOALING CONDITIONS IN SAWYER BEND AND LOWER ENTRANCE TO CHAIN OF ROCKS CANAL, MISSISSIPPI RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-02354

SPLASH AND DISCONTINUOUS RUNOFF AS CREATORS OF FINE SANDY LAG DEPOSITS WITH KALAHARI SANDS,
J. Savat, and J. Poesen.
Catena, Vol 4, p 321-332, 1977. 6 fig, 27 ref.

Descriptors: *Sediment transport, *Impact(Rainfall), *Particle size, Rainfall-runoff relationships, Sands, Erosion, Channel erosion, Sedimentation rates, Slope stability, Silts, Laminar flow.

The sand-covered western border of the Kwango Plateau, belonging to the Kalahari system, was cut during the Quaternary by tributaries of the Zaire River running toward the sea. Sedimentation of these sands has since been the focus of several investigations aimed at determining the processes that alter grain size distribution. A study of the large convex dome-shaped hills found near the city of Kinshasa reveals that splash and discontinuous runoff are the dominant erosion processes shaping these hills. Typically, their sand cover becomes progressively finer downhill where the slope is steeper. For the present study, 33 samples were taken from four locations on the top and slopes of Amba Hill. Grain size parameters were measured. Only fine sand, silt, and clay below .214 mm were found on the downhill convex western slope. Laboratory simulation illustrated that splash alone was not responsible for this sorting as it leaves the coarsest sands (7.6 mm) behind on the hilltop. Disturbed laminar flow is found to accomplish this sorting since it affects all grains including those coarser than 1.0 mm. Very fine fractions were found to be protected to some extent by the formation of a filtration pavement. (Tickes-Arizona)
W79-02393

HYPERSALINE LAGOONAL DEPOSITS AND PROCESSES,
University of Southern California, Los Angeles. Dept. of Geological Science.
For primary bibliographic entry see Field 2L.
W79-02430

HOLOCENE FAULTING IN THE WESTERN GRAND CANYON, ARIZONA,
Wyoming Univ., Laramie. Dept. of Geology.
P. W. Huntoon.
Geological Society of America Bulletin, Vol. 88, p. 1619-1622, November 1977, 4 fig, Doc. No. 71108. OWRT B-031-WYO(3), 14-34-0001-6134.

Descriptors: *Structural geology, *Faults, Geologic formations, Displacements, Geomorphology, Arizona, *Holocene movement, *Western Grand Canyon(Ariz), Toroweap fault, Hurricane fault, Southwestern Colorado Plateau.

The Toroweap and Hurricane faults and a subsidiary fault in the western Grand Canyon exhibit evidence of Holocene movement. This evidence includes scarps in alluvium and sediments ponded against a fault on the downthrown block. These displacements are the latest in a well-exposed record of recurrent movements along the major faults in the region.
W79-02496

2K. Chemical Processes

ATMOSPHERIC FORMATION, DISPERSION, AND DEPOSITION OF ACID SUBSTANCES,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5A.
W79-02015

THE ORIGIN OF LABYRINTH AND TOWER KARST AND THE CLIMATIC CONDITIONS NECESSARY FOR THEIR DEVELOPMENT,
Georgia Univ., Athens.
For primary bibliographic entry see Field 2F.
W79-02073

SYSTEMATIC ABSORBANCE ERRORS WITH TECHNICON AUTOANALYZER II COLORIMETERS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
P. N. Froelich, and M. E. Q. Pilson.
Water Research, Vol 12, No 8, p 599-603, 1978. 4 fig, 5 ref.

Descriptors: *Colorimetry, *Instrumentation, *Sea water, Refractivity, Automation, Equipment, Laboratory tests, Optical properties, Phosphates, Salinity, Aqueous solutions, Light, Absorption, Water properties, Chemical analysis, Autoanalyzer colorimeters, Flowcells.

Technicon AutoAnalyzer II colorimeters have spectrophotometric flowcells with curved optical ends. Light passing through these flowcells is refracted severely at the non-perpendicular ends. Curved ends, therefore, cause differences in apparent absorbance measured at the phototube; the absorbance differences are related to differences in the refractive indices of the solutions in the cells. This can cause significant error in the colorimetric analysis of solutions with different refractive indices (caused, for example, by variations in salinity). This effect is responsible for a systematic error which, for typical AutoAnalyzer determinations of phosphate in seawater or estuarine waters, can approximate 0.2 micro M. (Sims-ISWS)
W79-02074

ION MOBILITIES IN PURE WATER VAPOUR AT SATURATION,
Missouri Univ.-St Louis. Dept. of Physics.
For primary bibliographic entry see Field 1B.
W79-02076

MEASUREMENT OF CHELATING AGENT LEVELS IN MEDIA WITH HIGH CONCENTRATIONS OF INTERFERING METAL IONS,
Missouri Univ.-Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-02079

ATOMIC ABSORPTION DETECTOR FOR CHROMIUM ORGANOMETALLIC COMPOUNDS SEPARATED BY HIGH SPEED LIQUID CHROMATOGRAPHY,
Missouri Univ.-Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W79-02080

TRITIUM IN THE WATERS OF YELLOWSTONE NATIONAL PARK,
Geological Survey, Menlo Park, CA., Water Resources Div., and Geological Survey, Menlo Park CA., Geologic Div.
For primary bibliographic entry see Field 2F.
W79-02130

ORIGINS OF WATER AND SOLUTES IN THE GEOPRESSURED ZONES OF THE NORTHERN GULF OF MEXICO BASIN,
Geological Survey, Menlo Park, CA. Water Resources Div.
Y. K. Kharaka, W. W. Carothers, and P. M. Brown.
Paper SPE 7505 presented at the 53rd Annual Fall Technical Conference and Exhibition of the Society of Petroleum Engineers of AIME, held in Houston, Texas, October 1-3, 1978. 8 p, 6 fig, 1 tab, 30 ref.

Descriptors: *Gulp of Mexico, *Chemical analysis, *Water analysis, *Geothermal studies, *Thermal water, *Oil fields, Texas, Louisiana, Coasts, Stable isotopes, Analytical techniques, *Formation water, Gulf Coast.

Detailed chemical analyses of 120 formation-water samples from 25 oil and gas fields in coastal Texas and Louisiana show that the salinity of water in the geopressured zones ranges from about 10,000 to 270,000 mg/liter dissolved and may be higher or lower than the salinity of water in the normally pressured zones. The formation waters in the geopressured zones are most probably modified connate waters representing the original marine water of deposition. The chemical composition of these waters, however, is markedly different from that of ocean water. The differences in composition resulted from physical and chemical interactions between water and sediments. (Woodard-USGS)
W79-02131

CHEMICAL QUALITY OF GROUND WATER IN FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Fairfax, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02133

INVESTIGATION OF MATRIX INTERFERENCES FOR AAS TRACE METAL ANALYSES OF SEDIMENTS,
Gulf South Research Inst., New Orleans, LA.
For primary bibliographic entry see Field 5A.
W79-02143

PROCEDURE FOR THE EVALUATION OF ENVIRONMENTAL MONITORING LABORATORIES,
Tracer Jitco, Inc., Rockville, MD.
For primary bibliographic entry see Field 5A.
W79-02149

REDOX POTENTIAL MEASUREMENTS AS AN INDICATION OF BIOCHEMICAL WELL PLUGGING,
Ground Water Associates, Inc., Arlington, MA.
For primary bibliographic entry see Field 5A.
W79-02170

INSTRUMENTS FOR MONITORING THE QUALITY OF NATURAL AND WASTE WATERS,
For primary bibliographic entry see Field 5A.
W79-02214

THE NATURE OF BASALT WEATHERING IN ISRAEL,
Hebrew Univ., Jerusalem, Rehovoth (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 2G.
W79-02238

APPLICATION OF THE ELECTRICAL DOUBLE LAYER THEORY TO PREDICT ION ABSORPTION IN MIXED IONIC SYSTEMS,
Technion-Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
I. Ravina, and Y. Gur.
Soil Science, Vol. 125, No. 4, p 204-209, April, 1978. 3 fig, 3 tab, 16 ref, 16 equ.

Descriptors: *Cation adsorption, Alkali metals, Ions, Hydration, Soil chemistry, *Poisson-Boltzmann equation.

A Poisson-Boltzmann equation including hydration forces and the dielectric saturation effects for describing the electric double layer was presented and compared with the Gouy-Chapman theory. Ionic concentrations in the double layer were calculated by the revised equation showing the specific adsorption of the various alkali metal cations. (Skogerboe-Colorado State)
W79-02314

CHEMICAL CHARACTERIZATION OF LOCAL AND STRATOSPHERIC PLUTONIUM IN OHIO SOILS,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5A.
W79-02320

THE BEHAVIO OF SULFATE ON SALT INPUT IN PODZOLIC BROWN EARTH,
Goettingen Univ. (West Germany). Inst. fuer Bodenkunde und Waldenaehrung.
P. K. Khanna, and F. Beese.
Soil Science, Vol. 125, No 1, p 16-22, January, 1978. 4 fig, 3 tab, 17 ref.

Descriptors: *Sulfates, *Salts, Adsorption, Chemical precipitation, *Podzols, Effluents, *Leachate, Sorption, Inorganic compounds.

The behavior of sulfate concentration in the leachate of an acid podzolic brown earth was studied, when a slug of neutral salt (KCl + KNO3) passed through the upper sulfate-enriched layers of the soil. The effluent of five undisturbed soil columns was collected daily, and H(+), Cl(-), and SO4(--) concentrations were measured. A constant flux of water, either 1.0 cm/day or 0.3 cm/day, was maintained. Sulfate concentration in the leachate showed a decrease when the salt passed the columns. The decrease correspond with an increase of H(+) and Cl(-) concentrations. The behavior of sulfate was almost the same irrespective of the flow rates. At the lower rate, sulfate retention was about twice that at the higher rate. Though precipitation of basic aluminum sulfates cannot be excluded, the behavoir of sulfate must be interpreted in terms of specific adsorption. (Skogerboe-Colorado State)
W79-02321

MECHANISM OF ZINC ADSORPTION BY IRON AND ALUMINUM OXIDES,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
M. Kalbasi, G. J. Racz, and L. A. Loewen-Rudgers.
Soil Science, Vol. 125, No. 3, p 146-150, March, 1978. 1 fig, 1 tab, 13 ref.

Descriptors: *Adsorption, *Zinc, *Iron oxides, *Aluminum oxides, Ion exchange, Aqueous solutions, Soil chemistry, Hydrogen ion concentration, Chlorides.

Adsorption of Zn from aqueous solutions of ZnCl2 by hydrated A1203 and Fe203 was highly pH-dependent and increased markedly with increasing pH. Fe203 had a higher Zn adsorption capacity, at equivalent pH values, than A1203. Experimental observations suggested that surface aqus (-OH2) and hydrono (-OH) groups were involved in Zn adsorption. In addition, experimental observations lead to the postulation that two types of adsorption, specific and nonspecific, depending upon reversibility (exchangeability with Ba(2+)), occurred. Specific and nonspecific adsorptions of Zn(2+) were accounted for 60 to 90 percent and 40 to 10 percent of the total Zn adsorption respectively. For specific adsorption, an olation bridge structure between Zn(2+) and two surface -OH2 groups was postulated; and for nonspecific adsorption, a single-bond structure in which ZnCl(+) replaced one H(+) from surface -OH2 groups was postulated. The ratio of specific to nonspecific adsorption increased with increasing pH. It was concluded that specific adsorption of Zn by A1203 and Fe203 may be at least partially responsible for the frequently reported fixation and unavailability of added Zn to soils. (Skogerboe-Colorado State)
W79-02359

REACTION PRODUCTS AND SOLUBILITY OF APPLIED ZINC COMPOUNDS IN SOME MANITOBA SOILS,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
M. Kalbasi, G. J. Racz, and L. A. Lewen-Rudgers.
Soil Science, Vol. 125, No. 1, p 55-64, January, 1978. 4 fig, 6 tab, 26 ref.

Descriptors: *Zinc, *Solubility, *Sulfates, Sulfides, Ammonium compounds, Fertilizers, X-ray diffraction, Calcareous soils, Soil chemistry, *Canada, *Manitoba.

ZnSO4, ZnEDTA, ZnS, and ZnSO4 plus NH4H2PO4 were banded in soils, and the solid-phase zinc compounds were identified using x-ray diffraction analysis. Solubility of zinc in soil adjacent to the fertilizer band was determined by measuring the zinc concentration in soil-water extracts. The reaction product in a noncalcareous soil (pH 8.2) treated with ZnSO4, was Zn(OH)2, which was metastable and persisted for only a few weeks. ZnSO4 was usually precipitated as ZnCO3 and Zn5(CO3)2(OH)6 in the calcareous soils. No crystalline reaction products were detected in soils treated with ZnEDTA. Zn5(CO3)2(OH)6 and Ca(Zn(OH)3)2.2H2O were found in a calcareous soil treated with ZnS and incubated for 32 weeks. Zn3(PO4)2.4H2O and NH4ZPO4 were identified in soils treated with ZnSO4 plus NH4H2PO4. Concentrations of zinc in water extracts of soils treated with zinc increased in order: ZnS, ZnSO4, ZnEDTA. Zinc concentration in water extracts of soils treated with ZnSO4 or ZnEDTA decreased with time of incubation, whereas it increased in soils treated with ZnS. Addition of phosphate to ZnSO4 decreased zinc concentrations in soil-water extracts, as compared to soils treated only with ZnSO4. (Skogerboe-Colorado State)
W79-02362

RESIDUAL FORMS OF FERTILIZER NITROGEN IN FIELD SOILS,
Agricultural Research Service, Durant, OK. Water Quality Management Lab.
S. J. Smith, F. W. Chichester, and D. E. Kissel.
Soil Science, Vol. 125, No. 3, p 165-169, March, 1978. 1 fig, 2 tab, 17 ref.

Descriptors: *Fertilizers, *Nitrogen, Chemical analysis, *Nitrates, Chemical reactions, Aerobic conditions, Soil chemistry.

Residual fertilizer N was characterized in Houston Black clay and Keene silt loam surface soils from recent field microplot-N balance studies involving liberal (328-560 kg N/ha) 15N-labeled rates. Results indicate residual N is readily distributed in all the organic and inorganic soil N forms, even after the first cropping season. An equivalent distribution of the residual N with the indigenous soil N, however, had not occurred after three years. During this period the residual N was more than twice as susceptible to mineralization as the soil N. Most of the residual N was incorporated in amino acid N-forms. (Skogerboe-Colorado State)
W79-02364

HULA VALLEY PEAT: REVIEW OF CHEMICAL AND GEOCHEMICAL ASPECTS,
Hebrew Univ., Jerusalem (Israel) Dept. of Organic Chemistry.
S. Brenner, R. Ikan, N. A. Agron, and A. Nissenbaum.
Soil Science, Vol. 125, No. 4, p 226-232, April, 1978. 3 fig, 2 tab, 32 ref.

Descriptors: *Peat, *Chemical properties, *Pleistocene epoch, Inorganic compounds, Organic matter, Stable isotopes, Geochemistry, *Israel(Hula Valley), Chlorides.

In the Hula Valley, Israel, four layers of peat of Middle Pleistocene to Holocene age, interbedded with limnic clays and marls, are found above 300-m depth. The main detrital minerals are kaolinite, montmorillonite, and illite. Average elemental values of organic and inorganic matters (on dry basis) present in each horizon and average calorific values of each horizon are reported. Organic constituents of the upper layer have been identified. A detailed quantitative investigation of the distribution with depth in the top peat layer of the humic, fulvic, and hymatomelanic acids, as well as of the beta-humus and humin, showed humin to be the dominant fraction of the organic matter. Analysis of the peat organic fractions for carbon and hydrogen stable isotopes shows that with depth the difference in delta C13 between the humic and fulvic acids disappears and the delta C13 stabilized at around-18 parts per thousand. The isotope data indicate the dynamic nature of the fulvic acid in the peat. The delta D values were around-60 parts per thousand, but the data are too meager for any firm conclusion. (Skogerboe-Colorado State)
W79-02365

A STATISTICAL EVALUATION OF SOME COLUMBIA RIVER BASALT CHEMICAL ANALYSIS,
Atomics International Div., Richland, WA. Rockwell Hanford Operations.
For primary bibliographic entry see Field 5A.
W79-02433

Group 2K—Chemical Processes

EFFECTS OF TEMPERATURE AND TIME ON HYDROXY ALUMINUM PHOSPHATE-MONTMORILLONITE COMPLEX,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 2G.
W79-02436

SUPERCOOLING OF WATER TO -92 DEGREES C UNDER PRESSURE,
Purdue Univ., Lafayette, IN. Dept. of Chemistry.
For primary bibliographic entry see Field 2C.
W79-02494

2L. Estuaries

AMMONIUM OXIDATION AND ITS SIGNIFICANCE IN THE SUMMER CYCLING OF NITROGEN IN OXYGEN DEPLETED SKAN BAY, UNALASKA ISLANDA, ALASKA,
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W79-02004

POTENTIAL IMPORTANCE OF BENTHIC CYSTS OF GONYAULAX TAMARENSIS AND G. EXCAVATA INITIATING TOXIC DINOFLAGELLATE BLOOMS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W79-02011

ROLE OF INORGANIC IONS IN CONTROLLING SEDIMENTATION RATE OF A MARINE CENTRIC DIATOM DITYLUM BRIGHTWELLI,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-02014

SYSTEMATIC ABSORBANCE ERRORS WITH TECHNICON AUTOANALYZER II COLORIMETERS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 2K.
W79-02074

AMINO ACIDS IN SALT MARSH DETRITUS,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-02086

THE NATURE OF GROWTH FORMS IN THE SALT MARSH GRASS SPARTINA ALTERNIFLORA,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
I. Valiela, J. Teal, and W. Deuser.
The American Naturalist, Vol. 112, No. 985, p 461-470, May-June, 1978. 4 fig, 1 tab, 32 ref.

Descriptors: *Salt marshes, *Grasses, *Plant growth, Rooted aquatic plants, Vegetation, Seeds, Marshes, Genetics, Succession, Nutrients, Nitrogen, Fertilization, Massachusetts, Spartina alterniflora tall form, Spartina alterniflora short form.

Long term fertilization was conducted on plots of Spartina alterniflora in Great Sippewissett Marsh, Massachusetts. Increases in nutrinet supply convert short form S. alterniflora into plants resembling the tall form in biomass/sq.m. and morphology. Competition for light is a probably cause of the tall form's growth habit. Added nutrients led to larger delta C13 values probably due to incorporation of heavier carbon from internal air spaces of S. alterniflora during high tide, when exchange of gases with the atmosphere is prevented. Interstitial water replenished at each tide is greater in areas supporting the tall-form vegetation. Greater densities of marsh mussels are found in tall-form areas. Their feeding and defecation lead to larger accumulations of particulate matter and nutrients in those areas. Nitrogen amounts delivered by algal nitrogen fixation does not differ greatly under the two forms. Seedling establishment usually produces tall-form plants. A higher percentage of tall form plants than short form produce seed. Electrophoretic results show no genetic differences; therefore, the form of seedlings is probably the result of competition for nutrients and is modified by other factors. Usually seedlings become established at the edge of banks and grow into tall plants. Sedimentation resulting in elevated marsh surfaces and consequent competition by extant plants producing vegetatively results in short plants. This succession may be reversed by an increase in nutrient supply. This pattern over time and space is probably found in a variety of other aquatic plants.
W79-02087

DO TIDES AFFECT COASTAL INSECT COMMUNITIES,
Houston Univ., TX. Dept. of Biology.
G. N. Cameron.
The American Midland Naturalist, Vol 95, No 2, p 279-287, April 1976. 4 tab, 32 ref.

Descriptors: *Tides, *Insects, *Communities, *Tidal effects, Marshes, Coastal marshes, Salt marshes, Flooding, Water level fluctuations, Vegetation, Marsh plants, Population.

Clip-quadrat samples taken prior to, during and after inundating tides in Salicornia and Spartina salt marshes during 1 year revealed that periodic tidal inundation had little effect upon the number of adult species or their vertical stratification within the marsh vegetation. Possible explanations for the insects remaining in the marsh during inundation are considered. Sorensen's Quotient of similarity demonstrated little alteration in species composition, and a trophic analysis showed no change in the relative proportion of herbivores, saprovores or predators as a result of inundation. The possibility that salt-marsh insects remaining in place on the vegetation during inundating tides may be a result of early morning sampling is considered. Early morning low temperatures suppress the insect's metabolic rate and increase the chance of survival during inundation on the limited amount of oxygen available in surface bubbles. These findings support previous conclusions that salt-marsh insect populations are regulated primarily by biological rather than physical factors. (Maroncelli-Mass)
W79-02089

THE DISTRIBUTION OF JUNCUS ROEMERIANUS IN THE SALT MARSHES OF NORTH AMERICA,
Gulf Coast Research Lab., Ocean Springs, MS.
L. N. Eleuterius.
Chesapeake Science, Vol 17, No 4, p 289-292, December, 1976. 1 fig, 1 tab, 25 ref.

Descriptors: *Aquatic plants, *Salt marshes, *Distribution, *North America, Coastal marshes, Marshes, Wetlands, Gulf coastal plain, Atlantic coastal plain, Distribution patterns, Juncus roemerianus.

Although scattered individuals of Juncus roemerianus Scheele may be found northward in New Jersey, Long Island, New York, Connecticut and southward along the Laguna Madra in Texas, Mexico, and on the Caribbean Islands, the species is most prevalent within the South Atlantic and Gulf coastal marshes of the eastern United States. Here there are approximately 3,174,333 hectares of salt marsh of which 72.9% occur on the Gulf coast and 27.1% on the Atlantic coast. Juncus roemerianus dominates 20.7% of the marsh in the south Atlantic states and 7.3% of the Gulf coast marshes, but covers more marsh area on the Gulf coast (170,067 hectares) than on the Atlantic coast (149,316 hectares). Thus, there are approximately 320,000 hectares of salt marsh dominated by J. roemerianus in North America. (Maroncelli-Mass)
W79-02093

BIOCHEMICAL AND TRANSPIRATION STUDIES OF THE GROWTH FORM OF SPARTINA ALTERNIFLORA ON CONNECTICUT SALT MARSHES,
Connecticut Coll., New London. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-02101

THE AUTECOLOGY OF SAWGRASS IN THE FLORIDA EVERGLADES,
Agricultural Research Service, Fort Lauderdale, FL. Southern Region.
K. K. Steward, and W. H. Ornes.
Ecology, Vol. 56, No. 1, p 162-171, Winter, 1975. 4 fig, 9 tab, 26 ref.

Descriptors: *Plant ecology, *Rooted aquatic plants, *Florida, Ecology, Nutrients, Seasonal, Standing crops, Nutrient requirements, Marshes, Wetlands, Primary productivity, Nitrogen, Phosphorus, Potassium, Copper, *Sawgrass.

Standing crop, plant density, stem length, leaf numbers, growth rate, and nutrient relationships in plant tissue, soil, and water were estimated monthly over a 12-18 mo period in mature sawgrass stands as well as in stands regrowing after fires. Daily rainfall and water depth were also measured. Mature stands showed little seasonal variation in standing crop, plant density, and concentration of most inorganic nutrients. Plant nutrient requirements were estimated to be low because nutrient levels in tissues were low as compared to those of other Everglade macrophyte species. Copper (Cu) and phosphorus (P) were particularly low. Levels of available nutrient in soil varied with no seasonal pattern. Most nutrients were in adequate supply, except that available nitrogen (N), P, potassium (K) and Cu were generally very low. Concentration of most nutrients in culms regrowing after fires was high during early growth stages, but decreased to levels found in older culms after 3-5 mo. Concentrations of calcium, iron, and zinc were exceptions. After 18 no growth, burned stands had produced only 38% of the standing crop contained in unburned mature stands. The apparent low nutrient requirements of sawgrass may partially explain the dominance of this plant in the marsh community. (Stihler-Mass)
W79-02104

AN EXAMINATION OF LEGISLATION FOR THE PROTECTION OF THE WETLANDS OF THE ATLANTIC AND GULF COAST STATES,
Mississippi Univ., University. School of Law.
For primary bibliographic entry see Field 6E.
W79-02106

ANGIOSPERM PRODUCTION OF THREE VIRGINIA MARSHES IN VARIOUS SALINITY AND SOIL NUTRIENT REGIMES,
Virginia Inst. of Marine Science, Gloucester Point, VA.
I. A. Mendelssohn, and K. L. Marcellus.
Chesapeake Science, Vol. 17, No. 1, p 15-23, March, 1976. 5 fig, 6 tab, 52 ref.

Descriptors: *Vegetation, *Productivity, *Marshes, Salinity, Nutrients, Soils, Nitrogen, Phosphorus, Salt marshes, Estuaries, Rooted aquatic plants, Angiosperms, Oligohaline, Mesohaline, Euhaline, Virginia.

The net aerial angiosperms productivity, salinity, and soil nutrient composition were determined for three Virginia marshes. Oligohaline Ware Creek Marsh and mesohaline Carter Creek Marsh were most productive, 563 and 572 g/sq m/yr, respectively, while euhaline Wachapreague Marshes was least productive, 362 g/sq m/yr. Species in Carter and Ware Creek Marshes were clustered into associations based on salinity tolerance. Nitrogen and phosphorus concentrations of Spartina alterniflora tissue were high in the spring and decreased as the growing season continued. Soil nutrient concentrations were variable, and trends during the growing season were not discernible. No significant correlations were found between soil and plant nutrient concentrations. Although the empirical data sug-

gests that high soil salinity and low soil nitrogen and phosphorus concentrations limited primary productivity in Wachapreague Marsh, a multiple regression of standing crop on these parameters did not delineate any as the primary factors limiting salt marsh production. (Maroncelli-Mass)
W79-02108

AN ATLAS OF VASCULAR PLANT SPECIES DISTRIBUTION MAPS FOR TIDEWATER MARYLAND,
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
For primary bibliographic entry see Field 2I.
W79-02109

A BIBLIOGRAPHY OF MARYLAND'S TIDAL WETLANDS (MARSHES-SWAMPS),
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
W. S. Sipple.
Wetland Publication No. 3, July, 1978. 544 ref.

Descriptors: *Bibliographies, *Wetlands, *Maryland, Coastal marshes, *Tidal marshes, Swamps, Waterfowl, Wading birds, Marsh plants, Submerged plants, Wildlife, Marsh management.

Reference include information on Maryland wetland vegetation, flora, fauna, ecology, management, planning, law, soils, and ontogeny. Faunal references include predominantly those groups that are most characteristic of vegetated wetlands such as waterfowl, wading birds, furbearers, some amphibians and reptiles, wetland invertebrates, fish references have not been included. Materials on submerged aquatic vascular plants are also included because of their importance to waterfowl. (Steiner-Mass)
W79-02111

BARRIER ISLANDS OF THE ATLANTIC AND GULF COASTS OF THE UNITED STATES: AN ANNOTATED BIBLIOGRAPHY,
Gulf South Research Inst. Baton Rouge, LA.
J. D. Bagur.
Fish and Wildlife Service, Biological Services Program, April, 1978, Report FWS/OBS-77/56. 215 p. 14-16-0008-2113.

Descriptors: *Bibliographies, *Barrier Islands, *Atlantic Ocean, Coast, Atlantic coastal plain, Gulf coastal plain, Gulf of Mexico, Wildlife, Vegetation, Geology, Wetlands, Islands.

The 953 entries are arranged geographically by state and by island from Maine to Texas. Under each island name, entries appear in alphabetical order by senior author's last name. Annotations are provided in all but a few cases. Author and subject indices are provided. (Stihler-Mass)
W79-02113

EFFECTS OF SIMULATED FLOODING ON ALLIGATOR EGGS,
Louisiana Wildlife and Fisheries Commissionm, Grand Chenier.
T. Joanen, L. McNease, and G. Perry.
Paper presented at 31st Annual Meeting, Southeastern Association of Game and Fish Commissioners, October 9-12, 1977, San Antonio, Texas. 7 p. 2 tab, 6 ref.

Descriptors: *Submergence, *Hatching, *Flooding, Wetlands, Coastal marshes, Hurricanes, Wildlife, Reptiles, Mortality, Louisiana, *Alligator, *Eggs, Simulation analysis.

Alligator (Alligator mississippiensis) eggs were collected at four intervals during incubation and subjected to a single submergence to test the effects of flooding on hatchability. Treatments consisted of a 2-hour, 6-hour, 12-hour, and a 48-hour submergence. Hatching success was significantly related to the duration of immersion. Minor flooding can be tolerated, however, extended submergence for 12 hours or longer after the first 30 days of incubation produced total mortality. (Stihler-Mass)
W79-02116

FOOD HABITS OF COASTAL MARSH RACCOONS WITH OBSERVATIONS OF ALLIGATOR NEST PREDATION,
Louisiana Cooperative Wildlife Research Unit, Baton Rouge.
D. M. Fleming, A. W. Palmisano, and T. Joanen.
Presented to the 30th Annual Conference of the Southeastern Association of Game and Fish Commissioners, October, 1976, Jackson, Mississipi, 23 p, 1 fig, 3 tab, 14 ref.

Descriptors: *Food habits, *Predation, *Mammals, *Reptiles, *Nests, *Coastal marshes, Food abundance, Crustaceans, Wildlife, Freshwater marshes, Flooding, Water levels, Seasonal, Marking techniques, Dye releases, Wetlands, Louisiana, *Raccoon, *Alligator, Intermediate marshes, Brackish marshes, Eggs.

Food habits of the coastal marsh raccoon, Procyon lotor magalodous Lowery, in Louisiana were studied from June 1973 to August 1974. The raccoon's role as predator of the eggs and hatchlings of the American alligator, Alligator mississippiensis, was also evaluated. Visual observations of nest predation, information obtained from radio-instrumented raccoons, and the use of Rhodamine B dye solution to spray egg clutches were utilized in data gathering. Scats were collected and examined for alligator remains or traces of the dye. Eight hundred and sixty-six raccoon scats were collected from the fresh, intermediate and brackish marsh types, an average of 24 scats per month per habitat type. Crustaceans were the major food item and comprised 49 percent of the yearly diet of raccoons. Fruits were important fall foods. Although not utilized in great quantities, insects were also important, particularly during periods of prolonged marsh flooding. A marked difference occurred between years in the incidence of raccoon predation on alligator nests ranging from no predation in the 1973 nesting season to 45 percent in 1974. The difference was believed related to water level and its influence on the feeding behavior and subsequent movement patterns. (Maroncelli-Mass)
W79-02117

ALLIGATOR DIETS IN RELATION TO MARSH SALINITY,
Louisiana Wildlife and Fisheries Commission, Grand Chenier.
L. McNease, and T. Joanen.
Paper presented at the 31st Annual Meeting of the Southeastern Association of Game and Fish Commissioners, October 9-12, 1977, San Antonio, Texas. 11 p, 2 tab, 10 ref.

Descriptors: *Food habits, *Salinity, *Marshes, Louisiana, Wetlands, Reptiles, *American alligator.

Three hundred and fourteen large American alligators (Alligator mississippiensis) collected in the marshes of southwest Louisiana in conjunction with 1972 and 1973 autumn hunting seasons were examined for food contents. Foods were categorized by year and marsh type (brackish, intermediate, and fresh). Vertebrates were the most important foods consumed, of which mammals comprised the largest percentage by weight. Arthropods and fish were important foods in the more saline areas. Thirteen percent of the adult females contained alligator eggs or egg shells in their stomach. (Stihler-Mass)
W79-02118

ORIGINS OF WATER AND SOLUTES IN THE GEOPRESSURED ZONES OF THE NORTHERN GULF OF MEXICO BASIN,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2K.
W79-02131

DISTRIBUTION OF SURFICIAL SEDIMENTS AND EELGRASS IN NEW YORK'S SOUTH SHORE BAYS: AN ASSESSMENT FROM THE LITERATURE,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
C. R. Jones, and J. R. Schubel.
Special Report 13, Reference 78-1, July 1978. 89 p, 31 fig, 22 tab, 33 ref, 3 append.

Descriptors: Grasses, *Sediment distribution, *New York, Bibliographies, Bays, *Eelgrass, *Sea grasses, Zostera marina.

An investigation was completed of all published and unpublished information available on the distributions of surficial sediment and eelgrass (Zostera marina) in New York's south shore bays. This report presents graphical and tabular summaries of findings for sediment texture and eelgrass cover. (NOAA)
W79-02162

YOU CAN TAILOR EFFLUENT BOD TO FIT THE RECEIVING-WATER ECOSYSTEM...AND ENHANCE THE ENVIRONMENT. URBAN AND FISH-PROCESSING WASTES IN THE MARINE ENVIRONMENT: BIOENHANCEMENT STUDIES AT TERMINAL ISLAND, CALIFORNIA,
University of Southern California, Los Angeles. Inst. for Marine and Coastal Studies.
For primary bibliographic entry see Field 5E.
W79-02164

TRANSPORTATION AND ACCUMULATION OF FINE-GRAINED SEDIMENTS IN THE ESTUARINE ENVIRONMENT: RECOMMENDATIONS FOR RESEARCH,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
J. R. Schubel, H. J. Bokuniewicz, and R. B. Gordon.
Special Report No. 14, Reference 78-2, July 1978. 17 p, 2 append.

Descriptors: *Estuarine environment, *Sediment transport, *Estuaries, Sedimentary processes, Fine-grained sediments.

A Workshop on Transport Processes in Estuaries was held at the Marine Sciences Research Center, State University of New York, Stone Brook, New York from 10 November to 14 November 1976. Thirty-one participants from some 18 institutions and agencies focused their discussions on transport of water, salt, and fine-grained suspended sediments. It was concluded that there is no comprehensive method for comparing different estuarine sedimentary regimes. The kinds of studies recommended are designed to produce, not only a better understanding of estuarine transport mechanisms, but more specifically to produce, a significant improvement of knowledge of those sedimentary processes that characterize estuarine systems. Development of an estuarine sediment system will require sustained research programs over periods of years, perhaps decades. Some of the more important research components of an estuarine sediment system may be of local, or regional importance and should be supported by appropriate State and Federal agencies. Regional funding mechanisms should be established to ensure sustained support of research and monitoring of estuarine systems. (NOAA)
W79-02165

SUBSURFACE GEOLOGICAL INVESTIGATION OF A PLEISTOCENE BRAIDED STREAM IN THE NORTHERN COASTAL PLAIN, DELAWARE (U.S.A.),
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 2J.
W79-02167

FLOTATION OF FRESH WATER ON SEA WATER, A HISTORICAL NOTE,
Arizona Univ., Tucson. Dept. of Hydrology and

Water Resources.
For primary bibliographic entry see Field 2F.
W79-02171

DREDGE SPOIL IN MISSISSIPPI SOUND,
University of Southern Mississippi, Hattiesburg.
For primary bibliographic entry see Field 5E.
W79-02188

INTERTIDAL ENVIRONMENT OF NORTHERN DUBLIN BAY,
Trinity Coll., Dublin (Ireland). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W79-02204

MECHANISM OF FORMATION AND FORECAST OF THE DEVELOPMENT OF THE VOLGA DELTA,
For primary bibliographic entry see Field 2J.
W79-02210

SEICHES IN THE BALTIC SEA AND THEIR EFFECT ON FLOODS IN THE NEVA RIVER DELTA,
B. A. Pomytkin.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 68-72, 1977. 4 fig, 2 tab, 14 ref. Translated from News of the All-Union Geographic Society (Izvestiya VGO), Vol. 109, No. 2, p 143-149, 1977.

Descriptors: *Seiches, *Oceans, *Deltas, *Surges, Floods, On-site investigations, Waves(Water), Gulfs, Water level fluctuations, Frequency, Sea level, Wind tides, Tides, Foreign research, Foreign countries, *USSR, *Baltic Sea, *Gulf of Finland, *Neva River Delta(USSR).

This paper was based on published material and on an analysis of recent marigrams of some gaging stations in the Gulf of Finland. Seiches observed in the Baltic Sea and in the Gulf of Finland were described on the basis of published data and field observations in 1973-1974. It was concluded that: (1) Periodically recurring standing waves, i.e., seiches, are observed throughout the year in the Baltic Sea and at the head of the Gulf of Finland. (2) Seiches with an oscillation period of 8 hours, forming during the passage of a cyclonic front across the Gulf of Finland and having an average oscillation amplitude of 20-30 cm and a maximum amplitude to 100 cm, are most frequent. (3) The next in frequency is a two-node seiche with a 24-hour period, an average amplitude of 40-50 cm, and a maximum amplitude to 150 cm. (4) Seiche oscillations, by becoming superposed on high water in the Neva delta, can cause an additional rise in level in the delta during a storm time of 50-60 cm or more. However, alone, in pure form, they cannot cause floods in Leningrad. (Humphreys-ISWS)
W79-02213

SURFACE DRIFTER MOVEMENTS OBSERVED IN PORT ANGELES HARBOR AND VICINITY, APRIL 1978,
Evans-Hamilton, Inc., Seattle, WA.
C. C. Ebbesmeyer, J. M. Cox, and J. M. Helseth.
NOAA Technical Memorandum ERL MESA-31, September 1978. 205 p, 7 fig, 3 tab, 7 ref, 6 plates.

Descriptors: *Estuaries, *Tidal effects, *Eddies, *Wind, Oil spills, Drifting(Aquatic), Washington, Port Angeles Harbor(Wash), *Surface drifters, Oil slicks, Strait of Juan de Fuca(Wash).

Described is a field experiment in which movements of surface drifters were observed nearshore within a fjord-like estuary, the Inner Strait of Juan de Fuca, Washington. The study area straddles a major sill (Green Point to Victoria) terminating between two prominant spits (Ediz Hook and Dungeness Spit). Reported herein for 23-30 April 1978 are position and trajectories for three types of drifting objects released primarily in the vicinity of Port Angeles Harbor (behind Ediz Hook): (1) 123 drift sheets - 10 to 15 each positioned several times per hour during daylight using a small aircraft; (2) 700 drift cards - 240 shore recoveries tabulated; and (3) 46 drogues - 4 to 5 each positioned several times per hour during daylight using a small craft. Preliminary analysis indicates complex patterns of tidal eddies and a tendency for westerly winds to drive floatable materials onshore. (NOAA)
W79-02221

SEASONAL FLUCTUATION OF WATER QUALITY (NUTRIENTS AND PIGMENTS) IN LOWER DELAWARE BAY,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5C.
W79-02223

PHOTOSYNTHETIC RATES OF MARINE ALGAE AS A FUNCTION OF INORGANIC CARBON CONCENTRATION,
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 5C.
W79-02224

NUTRIENT AND PARTICULATE FLUXES IN A SALT MARSH ECOSYSTEM: TIDAL EXCHANGES AND INPUTS BY PRECIPITATION AND GROUNDWATER,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W79-02235

SOFT-SHORE MACROBENTHOS ALONG THE SOUTH-WEST COAST OF WALES,
University Coll. of Swansea (Wales). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-02240

POLYCHLORINATED BIPHENYLS IN COASTAL MARINE ZOOPLANKTON: BIOACCUMULATION BY EQUILIBRIUM PARTITIONING,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-02242

INTERSTITAL WATER CHEMISTRY OF ANOXIC LONG ISLAND SOUND SEDIMENTS. 2. NUTRIENT REGENERATION AND PHOSPHATE REMOVAL,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5C.
W79-02243

BLOOMS OF SURF-ZONE DIATOMS ALONG THE COAST OF THE OLYMPIC PENINSULA, WASHINGTON, IX. FACTORS CONTROLLING THE SEASONAL CYCLE OF NITRATE IN THE SURF AT COPALIS BEACH (1971 THROUGH 1975),
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-02244

A BUDGET OF NITROGEN RECYCLING IN NORTH SEA SEDIMENTS OFF THE BELGIAN COAST,
Brussels Univ. (Belgium). Lab. d'Environnement.
For primary bibliographic entry see Field 5C.
W79-02245

FLUME EXPERIMENTS ON SAND, SILT, AND CLAY MIXTURES FROM THE OFFSHORE DREDGED MATERIAL DISPOSAL SITE, GALVESTON, TEXAS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5E.
W79-02348

AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON, EVALUATIVE SUMMARY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5C.
W79-02350

PHYSICAL MODEL SIMULATION OF THE HYDRAULICS OF MASONBORO INLET, NORTH CAROLINA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-02353

VELOCITY AVERAGING IN ESTUARIES CHARACTERIZED BY A LARGE TIDAL RANGE TO DEPTH RATIO,
South Carolina Univ., Columbia. Dept. of Geology.
B. Kjerfve.
Estuarine and Coastal Marine Science, Vol. 3, p 311-323, 1975, 4 fig, 4 tab, 17 ref. OWRT B-035-GA(3), 14-31-0001-1892.

Descriptors: *Estuaries, *Flow rates, Water circulation, Tidal waters, *Estuarine flow velocities, Velocity profiles.

A general procedure to compute net velocity profiles is proposed for estuaries with a large ratio, Epsilon, of tidal range to mean water depth. Such a technique is desirable in view of the continued interest and numerous and varied research efforts in shallow estuarine waters where flow informaion is essential. Because epsilon exceeds 0.3 in many coastal plain and bar-built estuaries, problems arise in the computation of time-averaged velocity profiles. However, by non-dimensionalization of the depth before time-averaging, these problems are avoided. Rational procedures for the calculation of flow discharge and flux of dissolved and suspended constituents are also proposed for estuaries with a large epsilon-ratio. The averaging procedures are illustrated by computations on 561 velocity profiles measured in the Duplin River, A Georgia (U.S.A) coastal plain estuary with epsilon = 0.5.
W79-02355

EARTHQUAKE-INITIATED CHANGES IN THE NESTING HABITAT OF THE DUSKY CANADA GOOSE,
Rutgers - The State Univ., Newark, NJ. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W79-02416

THE VEGETATION OF SOUTHERN FLORIDA,
University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W79-02425

EFFECT OF DISSOLVED OXYGEN AND REDOX POTENTIAL AND NITRATE REMOVAL IN FLOODED SWAMP AND MARSH SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W79-02426

EFFECTS OF AN ORGANIC ARSENICAL HERBICIDE ON A SALT MARSH ECOSYSTEM,
Auburn Univ., AL. Dept. of Biology; and Auburn Univ., AL. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W79-02427

HYPERSALINE LAGOONAL DEPOSITS AND PROCESSES,
University of Southern California, Los Angeles.

Dept. of Geological Science.
S. P. Vonder Haar, and D. S. Gorsline.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-034 208, Price codes: A03 in paper copy, A01 in microfiche. Report USC-GEOL 76-02, April, 1976. 42 p, 8 fig, 2 tab, 62 ref.

Descriptors: *Saline water systems, *Lagoons, Wetlands, Marshes, Saline lakes, Saline water, Salinity, Salt marshes, California, Pacific coast region, Baja(Mexico), Sonora coast(Mexico), Laguna Mormona(Mexico), Saline Grande(Mexico), Ometepec Salina(Mexico).

Evaporite and algal-carbonate sediments are accumulating in coastal lagoons along the Pacific and Gulf of California coasts of Baja California and Sonora, Mexico. Analysis of the cycles of deposition was made using three years of ERTS imagery with ground surveys to establish the ERTS analysis. These data plus field work document rates of sedimentation of the facies type. Fluctuations of sea level and subsidence can produce vertical cyclic successions of marine marginal evaporite facies with terrigenous or marine facies. The geologic record show stacks of such sabkha cycles of all ages and confirm Shearman's observation that sabkha measures of desert coasts are as significant as coal measures of more humid coasts. (Steiner-Mass)
W79-02430

EFFECTS OF THERMAL DISCHARGES ON MORTALITY OF MERCENARIA MERCENARIA IN BARNEGAT BAY, NEW JERSEY,
Jersey Central Power and Light Co. Morristown, NJ. Environmental Affairs Dept.
For primary bibliographic entry see Field 5C.
W79-02473

ECO-BIOCHEMICAL STUDIES ON SOME ECONOMICALLY IMPORTANT INTERTIDAL ALGAE FROM PORT OKHA (INDIA),
Saurashta Univ., Rajkot (India). Dept. of Biosciences.
For primary bibliographic entry see Field 5C.
W79-02475

ORGANCHLORINES IN CODFISH FROM HARBOURS ALONG THE NORWEGIAN COAST,
Norges Veterinarhoegskole, Oslo. Dept. of Pharmacology and Toxicology.
For primary bibliographic entry see Field 5C.
W79-02479

THE POLLUTION OF SEA-WATER IN NAGASAKI BAY IN SUMMER 1976 AND 1977, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5B.
W79-02482

EFFECT OF BARITE (BASO4) ON DEVELOPMENT OF ESTUARINE COMMUNITIES,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W79-02484

THE EFFECTS OF PETROLEUM ON THE SALT MARSH ECOSYSTEM,
College of William and Mary, Williamsburg, VA. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5C.
W79-02485

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DESALINATION REVERSE OSMOTIC MEMBRANES AND THEIR PREPARATION,
Shinetsu Chemical Co., Tokyo (Japan). (Assignee).
S. Arai, and F. Akiya.
U.S. Patent No. 4,111,810, 4 p, 2 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 331, September 5, 1978.

Descriptors: *Patents, *Desalination, *Waste water treatment, *Water quality control, Reverse osmosis, Membrane processes, Membranes, Semipermeable membranes, Separation techniques, Chemical properties, Strength, Chitin, Chitosan.

Semipermeable membranes useful in reverse osmosis and a process of preparing them comprises deacetylating naturally occurring chitin to produce chitosan. A film of chitosan salt is made from an acid diluted aqueous solution of the chitosan having free amino groups by neutralizing the acid groups, and then subjecting the film of chitosan to a chemical treatment with an organic acid. The chitosan is converted to the acetylated form, having a degree of acetylation from about 0.3 to 0.8, to produce the reverse osmotic membranes. The products have excellent chemical properties as well as mechanical strengths sufficient to withstand the pressure difference in the operating condition. (Sinha-OEIS)
W79-02338

3B. Water Yield Improvement

FACTORS INFLUENCING USEFULNESS OF ANTITRANSPIRANTS APPLIED ON PHREATOPHYTES TO INCREASE WATER SUPPLIES,
California Univ., Davis.
D. C. Davenport, R. M. Hagan, L. W. Gay, B. E. Kynard, and E. K. Bonde.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 171, Price codes: A09 in paper copy, A01 in microfiche. Contribution No. 176, Water Resources Center, University of California 1978, p 181, 108 fig, 60 tab, 159 ref, 10 append. OWRT C-6030 (No. 5235)(4), 14-31-0001-5235.

Descriptors: *Antitranspirants, *Evapotranspiration, *Phreatophytes, *Water yield improvement, *Wildlife habitat, Ecological balance, Energy budget, Lysimeter, Micrometeorology, Photosynthesis, Saltcedar, Stomata, Riparian water loss, *Transpiration control, *Riparian phreatophytes.

The continuous availability of groundwater to riparian phreatophytic vegetation such as saltcedar (Tamarix sp.) and cottonwood (Populus sp.) results in large transpiration rates usually coincide with peak consumer demands for ground- and streamwater. Removal of this vegetation can cause ecological imbalances and be environmentally and aesthetically unacceptable. Spraying a nontoxic antitranspirant (AT) on phreatophyte foliage, on the other hand, may reduce transpiration losses and also preserve the vegetation. This research project therefore investigates: (1) the magnitude of water lost through transpiration by phreatophytes using gravimetric, lysimetric and energy budget techniques; (2) plant and environmental factors which influence the water relations of the vegetation, using porometer, pressure chamber, and gas-exchange measurements; (3) selection of suitable AT materials by laboratory and greenhouse screening tests; (4) field testing of ATs, sprayed from the ground and by air, for transpiration reduction; and (5) AT effects on terrestrial and aquatic wildlife of riparian habitats using acute toxicity and other experiments. Conclusions are made on: (1) phreatophyte transpiration rate as affected by environment, plant density, and species; and (2) the benefits of AT treatment, as an alternative to phreatophyte eradication, for water conservation, improvement in water quality, and preserving the environment and ecological balance. (Snyder-Calif, Davis)
W79-02291

DESIGN AND THE DESERT ENVIRONMENT: LANDSCAPE ARCHITECTURE IN THE AMERICAN SOUTHWEST,
Arizona Univ., Tucson. Office of Arid Lands Studies.
J. D. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 955, Price codes: A11 in paper copy, A01 in microfiche. Arid Lands Resource Information Paper, No. 13, October 1978, 216 p. 84 fig (inc. photos), 2 tab, 174 ref. OWRT W-211(No 6254)(2).

Descriptors: *Landscaping, *Southwest U.S., *Aesthetics, *Vegetation establishment, *Soil-water-plant relationships, *Drought resistance, *Drought-tolerance, Mulching, Design criteria, Lawns, Ornamentals, Shrubs, Trees, Desert plants, Shelterbelts, Drip irrigation, Water harvesting, Plant physiology, Erosion control, Xerophytes, Vegetation effects.

Landscape architecture (environmental design) in the hot, arid southwestern U.S. must respond to the extremes of climate, the distinctive landforms, and the vegetative communities that combine to create unique patterns within the desert landscape. Human comfort is defined and serves as a criterion for the manipulation of microclimates to achieve a relative sense of comfort within a hot arid environment. Methods of solar radiation control, wind control, and conservation of water resources are reviewed. The text is supplemented with many illustrations and drawings. Over 200 drought-tolerant plant species are listed for use in the desert landscape. Cultural information for each plant is included in a matrix, and many of the plants so described are represented photographicaly as well. In addition to the references used for the text, a computerized bibliography, includng abstracts, of related topics is added in the appendix.
W79-02389

ESTABLISHMENT OF NATIVE PLANTS FOR THE REHABILITATION OF PARAHO PROCESSED OIL SHALE IN AN ARID ENVIRONMENT,
Utah State Univ., Logan. Inst. for Land Rehabilitation.
For primary bibliographic entry see Field 4A.
W79-02391

3C. Use Of Water Of Impaired Quality

TRANSPIRATION EFFECTS ON LEACHING FRACTIONS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
A. Meiri, J. Kamburov, and J. Shalhevet.
Agronomy Journal, Vol. 69, No. 5, p 779-782, September-October 1977. 2 fig, 2 tab.

Descriptors: *Leaching, *Infiltration, Soil water, Soil moisture, *Soil water movement, Saline water, Irrigation water, Salinity, Salts, Seepage, *Transpiration.

Water uptake by plants during the processes of infiltration and redistribution may introduce considerable errors in actual leaching when calculations are based on preirrigation soil water deficit. The objective of this study was to measure and demonstrate the importance of this water uptake in causing a reduction in the actual leaching. (Skogerboe-Colordo State)
W79-02019

SUGAR CANE GROWTH IN RESPONSE TO MULCH AND FERTILIZER ON SALINE-ALKALI SUBSOILS,
Ministry of Overseas Development (England).
B. W. Eavis, and E. R. St. J. Cumberbatch.
Agronomy Journal, Vol 69, No 5, p 839-842, September-October, 1977. 2 fig, 2 tab, 8 ref.

Descriptors: *Mulches, *Sugar cane, *Crop response, Crop production, *Fertilizers, Fertilization, Nutrients, Salinity, Subsoils, Leaching, Land reclamation, *Saline soils, Alkalinity.

In many parts of the world where salinity or alkalinity limit crop yields, leaching is impracticable. In Barbados saline-alkali subsoils remained unproductive 6 years after they were exposed during earth-moving operations. The objective of this study was to devise agronomic techniques to restore these lands to sugar cane production. The effects of mulching and N-K fertilization were studied. Factorial field experiments in which bare plots and plots mulched with cut grass were treated with fertilizer at three rates were carried out at two locations (sandy clay and clay soil respectively). Sugar cane tillers and soil moisture contents were measured weekly, and root development fortnightly. After 9 months of growth bare plots failed to produce any marketable yield in contrast to mulched plots which gave up to 53 metric tons/ha (sandy clay) and 118 tons/ha (clay). There were no responses to fertilizer rate on bare land, but on mulched land 1.2 times (sandy clay) and 2.2 times (clay) more yield resulted from the high compared with the low fertilizer rate. (Skogerboe-Colorado State)
W79-02029

WATER QUALITY CAN AFFECT MANAGEMENT PLANNING,
For primary bibliographic entry see Field 5G.
W79-02096

DUAL WATER SUPPLIES: AN IDEA FOR THE FUTURE,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 3D.
W79-02175

A SYSTEMATIC PROCEDURE FOR TAXING AGRICULTURAL POLLUTION SOURCES,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W79-02219

PRELIMINARY EVALUATION OF FINAL CUT LAKES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5G.
W79-02292

WASTE WATER RECLAMATION APPARATUS,
For primary bibliographic entry see Field 5D.
W79-02341

3D. Conservation In Domestic and Municipal Use

THE ECONOMICS OF WATER CONSERVATION,
East Bay Municipal Utility District, Oakland, CA.
D. G. Larkin.
Journal of American Water Works Association, Vol. 70, No. 9, 470-473, September 1978. 2 fig, 1 ref.

Descriptors: *Water conservation, *Economics, *East Bay Municipal Utility District(CA), *Costs, *Droughts, *Water management(Applied), *California, Water shortage, Water supply, Public relations, Water rates, Financing, Regulation, Water utilization, Fixed costs, Social aspects, Public utilities.

Response to the 1976-77 California drought by the East Bay Municipal Utility District (EBMUD), serving parts of Alameda and Contra Costa Counties, is described. Water conservation and management efforts consisted of: (1) imposition of 25-35% cutbacks in water use; (2) rate increases to compensate for reduced water sales, including basic $.15/100 cu ft charges and excess use charges; (3) use of $6.8 million in federal drought relief loans and grants; (4) a public information campaign; and (5) retention of the drought surcharge after restrictions were lifted and a further rate increase. Conclusions: (1) most water utility costs do not vary with amount of water sold; (2) when water sales decrease, rates must go up; (3) a permanent decrease in water use of perhaps 15-20% is likely to persist after restrictions are lifted, due to altered customer water-use habits (including water-saving devices and lessened waste); and (4) this permanent decline in water use plus drought-related cost increases will probably require additional rate increases. In the EBMUD case, there was an increase of $3 million in operating costs and $4.5 million in drought-related construction costs, together with a reduction of 66% in net operating revenue in fiscal year 1977. A 33% water rate increase and the federal funds enabled the district to manage until the end of 1977, when another rate increase was necessary. The cutbacks and rate increases were accepted with cooperation and understanding by customers. (Lynch-Wisconsin)
W79-02022

FINANCING SYSTEM CHANGES,
Black and Veatch, Dallas, TX.
For primary bibliographic entry see Field 6C.
W79-02023

STRUCTURING WATER UTILITY BOND ISSUES TO COPE WITH INFLATION,
For primary bibliographic entry see Field 6C.
W79-02024

AN ANALYSIS OF NETWORK COSTS: A STUDY OF SYDNEY'S WATER SUPPLY FROM 1890 TO 2001, PART I: RESEARCH METHODS,
Australian National Univ., Canberra. Research School of Social Sciences.
For primary bibliographic entry see Field 6B.
W79-02033

URBAN WATER: ACCESS, DELIVERY AND INSTITUTIONAL SCARCITY,
For primary bibliographic entry see Field 6E.
W79-02036

DUAL WATER SUPPLIES: AN IDEA FOR THE FUTURE,
National Water Well Association, Worthington, OH.
M. R. Richard.
Water Well Journal, Vol. 30, No. 12, p 64-65, December 1978.

Descriptors: *Water supply, *Dual systems, *Recycling, Water quality, Water management(Applied), Groundwater, Water conservation.

Explored is the concept of dual water supply systems in which high quality water is used for drinking and cooking while lower quality water is used for other purposes. Water supplies can be classified as potable, subpotable, and nonpotable. Potable supplies would be of very high quality. Subpotable supplies might contain trace chemicals but no bacteria. Nonpotable supplies would be recycled wastewater used for irrigation, air conditioning and ground-water recharge. The advantages of dual water systems are: they conserve high quality water; total wastewater discharge and pollution are reduced; they might be cheaper than developing new fresh-water sources or treating large supplies. Dual water supplies can be used in regional water management. Water needs for a city are considered in the light of the quality and amount of available supplies. Examples of industrial, municipal and agricultural dual systems are given. The implementation of dual systems is compatible with increased ground-water development. Ground water is generally of higher quality than surface water and can be developed and treated less expensively. Dual systems are now only feasible for new systems rather than existing ones due to the high cost of redesigning existing pipelines to handle multiple grades of water. (Purdin-NWWA)
W79-02175

MANAGEMENT OF RURAL WATER SUPPLY PEAK FLOW RATES,
Utah Water Research Lab., Logan.
T. C. Hughes.
Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers, Vol. 104, No. WR1, Proceedings Paper 14148, p 129-137, November 1978. 2 fig, 5 tab, 4 ref.

Descriptors: *Water supply, *Rural areas, *Management, Design, Water distribution, Design standards, Water demand, Domestic water, Peak discharge, Flow, Flow rates, *Utah, *Statistical analysis, Flow restriction devices.

Flow rates in lines serving 4 and 15 families were recorded continuously during two summer peak periods on a low-density rural domestic water system in Utah. During the second summer, the potential flow rates at individual services were cut almost in half (from 11.0 gal/min to 6.3 gal/min average) by installing a small orifice in each service line. Analysis of the flow rate data and interviews with the water users produced conclusions which included the following: (1) Peak demands on this type of system almost never exceed 7 gal/min/service; and, therefore, the customers were essentially unaware of any reduction in the quality of service; (2) Distribution line peak flows were reduced by 7% to 20% by the orifices and could have been reduced much more by a slightly smaller orifice; and (3) Management of peak flows by simple orifices has important potential for sections of systems with marginal distribution line capacities. (Lee-ISWS)
W79-02194

PLANNING AND MODELING IN URBAN WATER MANAGEMENT,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 6B.
W79-02288

ECONOMIC IMPACT OF ALTERNATIVE STORMWATER DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D.
W79-02289

AN ECONOMIC APPROACH TO WATER SUPPLY PLANNING IN SOUTHEASTERN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. VA. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-02294

DESIGN AND THE DESERT ENVIRONMENT: LANDSCAPE ARCHITECTURE IN THE AMERICAN SOUTHWEST,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 3B.
W79-02389

POLLUTIONAL CHARACTERISTICS OF STORMWATER RUNOFF,
Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering.

For primary bibliographic entry see Field 5B.
W79-02451

3E. Conservation In Industry

OVERSEAS MARKETS FOR THE WATER INDUSTRY - NIGERIA,
For primary bibliographic entry see Field 5G.
W79-02030

NATURAL RESOURCES AND REGIONAL DISPARITIES: A SKEPTICAL VIEW,
For primary bibliographic entry see Field 6B.
W79-02034

THE PRICE OF NATURAL RESOURCES,
For primary bibliographic entry see Field 6C.
W79-02045

ECONOMETRIC ANALYSIS OF ENVIRONMENTAL POLICY: ESTIMATION OF A MODEL OF THE CANADIAN PULP AND PAPER INDUSTRY,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 6B.
W79-02046

IS IT TIME TO DO A BENEFIT-COST ANALYSIS FOR THE LOCATION OF A POWER PLANT,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-02054

NATURAL RESOURCES AND ENVIRONMENTAL RESTRICTIONS TO GROWTH,
Harvard Univ., Cambridge, MA.
For primary bibliographic entry see Field 6G.
W79-02056

OPTIMAL AND COMPETITIVE USE OF REPLENISHABLE NATURAL RESOURCES BY OPEN ECONOMIES.
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 6C.
W79-02058

THE CONTROVERSY CONTINUES: STATE OWNERSHIP OF DRILL RIGS,
Indiana State Board of Health, Indianapolis.
For primary bibliographic entry see Field 6E.
W79-02168

IMPROVED TECHNIQUES FOR EVALUATING CARBONATE WATERFLOODS IN WEST TEXAS,
Exxon Co., Houston, TX.
For primary bibliographic entry see Field 4B.
W79-02182

POSSIBILITY OF RENDERING BLEACHERY EFFLUENTS HARMLESS BY TECHNOLOGICAL CHANGES (UEBER DIE MOEGLICHKEIT BLEICHEREIABWAESSER DURCH TECHNOLOGISCHE AENDERUNGEN UNSCHAEDLICH ZU MACHEN),
Vyskumny Ustav Papieru a Celulozy Bratislava (Czechoslovakia). Forschungsinstitut fuer Zellstoff Und Papier.
For primary bibliographic entry see Field 5G.
W79-02360

3F. Conservation In Agriculture

AMMONIUM EFFECTS ON NUTRIENT CATION ABSORPTION BY WHEAT,
Western Australia Dept. of Agriculture, South Perth.
W. J. Cox, and H. M. Reisenauer.
Agronomy Journal, Vol. 69, No. 5, p 868-871, September-October 1977. 1 fig, 3 tab, 18 ref.

Descriptors: *Nutrients, Fertilizers, Fertilization, *Cations, *Absorption, *Wheat, Nitrogen, Potassium, Calcium, Zinc, Magnesium, Manganese.

Additions of small amounts of NH4 to adequate (-)N03 culture have been shown to increase crop yield and total N content, and to decrease the plant's content of metal cations. The magnitudes of these effects can be appreciable. Accordingly, experiments were done to elucidate their mechanisms, and to evaluate their roles in crop production. Wheat was grown in the greenhouse in dilute constant-composition cultures that supplied, in factorial combination, three levels of NH4 with four levels ofeither K, Ca, Mg, Mn, or Zn. Intake of mineral cations increased with the concentration of the ion in solution and was decreased by added NH4. (Skogerboe-Colorado State)
W79-02021

GROWTH AND YIELD OF SPRING WHEAT AS INFLUENCED BY SHELTER AND SOIL WATER,
Agricultural Research Service, Mandan, ND. Northern Great Plains Research Center.
A. B. Frank, D. G. Harris, and W. O. Willis.
Agronomy Journal, Vol. 69, No 6, p 903-906, November-December 1977. 1 fig, 6 tab, 20 ref.

Descriptors: *Windbreaks, *Wheat, Irrigation, Irrigation effects, *Crop production, Crop response, *Soil water, Wind velocity, Leaves.

In the Northern Great Plains, windbreaks have historicaly been used to protect crops and soils from winds, but data on the effects of windbreaks on growth and yield of small grains is limited. 'Waldron' wheat was grown on Parshall fine sandy loam with and without shelter (slat-fence enclosures), both with and without irrigation, to determine the effects of soil water and shelter on wheat growth and yield. In 1973 and 1974, plant height, tiller production, leaf area index, specific leaf weight, and dry matter were measured at tillering, heading, and grain-filling growth stages. Also, grain yield, kernel weight, number of heads, straw yield, and plant height were measured at crop maturity. (Skogerboe-Colorado State)
W79-02035

ISSUES IN WATER DEVELOPMENT DECISIONS: A DISCUSSION PAPER,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6B.
W79-02042

PLANT WATER RELATIONSHIPS OF SPRING WHEAT AS INFLUENCED BY SHELTER AND SOIL WATER,
Agricultural Research Service, Mandan, ND. Northern Great Plains Research Center.
A. B. Frank, D. G. Harris, and W. O. Willis.
Agronomy Journal, Vol 69, No 6, p 906-910, November-December 1977. 6 fig, 1 tab, 19 ref.

Descriptors: Micro environment, *Windbreaks, *Wheat, Irrigation, Irrigation effects, *Crop production, Crop response, *Soil water, Wind velocity, Leaves.

Field windbreaks have been planted primarily for soil erosion control; subsequently, research has shown that windbreaks have an effect on microclimate and on growth and yield of crops. Other research has shown that plant water relations respond to changes in microclimates. The present work was undertaken to determine the effect of microclimate changes induced by a slat-fence windbreak on the plant water relations of field-grown wheat. Slat-fence barriers were used as windbreaks for studying effects of shelter-modified microclimate on plant water relations of 'Waldron' spring wheat, grown on Parshall fine sandy loam under irrigated and dryland soil water regimes. Data were collected on leaf water potential, xylem water potential, stomatal diffusion resistance, canopy temperature, soil water potential, soil water extraction, and grain yield. (Skogerboe-Colorado State)
W79-02043

WATER UTILIZATION AND REALLOCATION IN CHILE: A STUDY OF THE PIRQUE VALLEY,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-02053

TILLAGE EFFECTS ON WINTER WHEAT PRODUCTION WHERE THE IRRIGATED AND DRYLAND CROPS ARE ALTERNATED,
P. W. Unger.
Agronomy Journal Vol. 69, No. 6, p 944-950, November-December 1977. 2 fig, 5 tab, 11 ref.

Descriptors: *Wheat, Irrigation, *Irrigation effects, *Crop production, *Cultivation, Crop response, Soil water, Soil moisture, Irrigation efficiency, Dry farming.

While adequately irrigated winter wheat yields are relatively high, dryland wheat yields in the southern Great Plains are only about 700 kg/ha with continuous cropping and about 1,000 kg/ha on a harvested area basis after fallow. This study was conducted to determine if yields could be increased where irrigated and dryland wheat crops are alternated on the same plots. Tillage effects were also studied. (Skogerboe-Colorado State)
W79-02088

DRIP STUDY SHOWS UP TO 30% WATER SAVINGS,
J. Schleicher.
Irrigation Age, Vol. 11, No. 4, p 37, 69, January, 1977. 1 fig.

Descriptors: Irrigation, Irrigation practice, Irrigation systems, *Irrigation efficiency, *Orchards, Crop production, *Water conservation, *Drip irrigation.

Tree crop farmers repeatedly hear how efficient drip irrigation is in relation to either sprinkler or furrow water application methods. But just how does 'drip efficiency' stack up in terms of comparative water savings with sprinkler and furrow techniques That question is the subject of a joint research project currently being sponsored by the University of California and the California Department of Water Resources on citrus farm near Parlier, California. The study centers around a 40-acres block of 8-year-old Navel oranges, chosen for the uniformity of soil, water and tree conditons. The acreage is divided into 12 five-row blocks permitting the researchers to create four replications each of the three irrigation methods. (Skogerboe-Colordo State)
W79-02090

MAKING THE DESERT FLOWER: IRRIGATING CALIFORNIA'S IMPERIAL VALLEY,
R. Mallory.
Irrigation Journal, Vol 27, No 5, p 19-20, 27, September-October, 1977, 2 fig.

Descriptors: *California, Water conservation, Water quality, *Crop production, Salinity, Saline soils, Furrow irrigation, *Imperial Valley(Calif).

'Making the desert flower' is a description heard many times in the irrigated farmlands of the West. But perhaps nowhere is the description more appropriate than in California's Imperial Valley. With less than three inches of rain per year in this southern-most California Valley, the land could not even be initiated into dryland wheat production as was much of the rest of the state. (Skogerboe-Colorado State)
W79-02092

CALCULATING THE COST OF EACH IRRIGATION,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
L. New.
Irrigation Age, Vol 11, No 9, p 56-57, July-August, 1977. 2 tab.

Descriptors: Irrigation, *Irrigation practices, Irrigation efficiency, Pumping, Economics, *Costs.

In view of today's energy costs, excessive irrigation amounts and poor field distribution patterns can seriously damage the profitability of a farming enterprise. You may have a good idea of your total pumping time, and your annual fuel costs per acre of land. But the best lead to your irrigation efficiency is to know how much water is pumped, and where it's going. You can obtain those figures by knowing your irrigation well capacity and the number of hours that a well or group of wells are pumped to irrigate a specific acreage. The specific acreage can be an irrigation set, a section of land, a field of corn, or even the actual acreage irrigated by a center pivot sprinkler. (Skogerboe-Colorado State)
W79-02094

CONTROLLING SEDIMENT IN SURFACE RUNOFF,
Agricultural Research Service, Kimberly ID. Snake River Conservation Research Center.
A. Humphreys.
Irrigation Age, Vol. 12, No. 1, p 22, 24, September, 1977. 1 fig.

Descriptors: *Sediments, Nutrients, Runoff, *Irrigation effects, Pesticides, Fertilizers, Salts, *Sediment control.

Irrigators are sometimes criticized for contaminating downstream waters with sediment, nutrient and pesticides contained in surface runoff from irrigation. Research studies have shown that the concentrations of dissolved fertilizer nutrients, pesticides and salts in surface runoff are essentially the same as those in the applied irrigation water. Thus, water passing over the soil surface does not usually pick up additional amounts of these materials. Significant increases in nutrient or pesticide concentration do occur when these materials are applied by adding them to the irrigation water or when the material falls into the water from spray application or is washed from the plants by rain. When fertigation and herbigation are practiced, runoff water should be retained in a reuse pond and not allowed to leave the farm or flow into natural streams. (Skogerboe-Colorado State)
W79-02097

ZINC NUTRITION OF RICE AS INFLUENCED BY RATES OF GYPSUM AND ZN FERTILIZATON OF ALKALI SOILS,
Punjab Agriculture Univ., Ludhiana. Dept. of Soils.
P. N. Takkar, and T. Singh.
Agronomy Journal, Vol. 70, No. 3, p 447-450, May-June, 1978. 2 fig, 2 tab, 15 ref.

Descriptors: *Rice, Nutrient requirements, *Zinc, *Gypsum, Alkaline soils, *Fertilization, Reclamation, Crop response, Submerged plants, *Calcium.

Three field experiments were conducted on Zn deficient alkali soils, two on Natraquic calciorthids, and one on Aquic Camborthids, to determine the effect of gypsum and Zn fertilization alone and in combination on the Zn nutrition of rice IR 8. Three rates of gypsum and three rates of Zn and their possible combinations were tried. At all the three locations, the growth of the rice crop was very poor and exhibited Zn deficiency symptoms in control plots. The yield and Zn uptake was higher in alkali soil high in CaCO3 and low in pH than in soils low in CaCO3 and high in pH. Gypsum application markedly decreased the soil pH, and significantly increased the yield and Zn uptake by rice. Zinc application decreased the pH, but not so appreciably as did gypsum; and markedly increased the available Zn from deficient to adequate levels. Optimum response of rice to Zn was observed at 11.2 kg Zn/ha except in one of the Natraquic calciorthids where it was 22.4 kg Zn/ha. The beneficial effect of Zn application to rice grown on the alkali soils under investigation was far more than that of gypsum. (Skogerboe-Colorado State)
W79-02099

LAWN SPRINKLER DISTRIBUTION PATTERNS,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
G. L. Kerr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 698, Price codes: A05 in paper copy, A01 in microfiche. M. S. Thesis, May 1978. 72 p, 16 fig, 7 tab, 8 ref, 2 append. OWRT B-035-WYO(1), 14-34-0001-7201.

Descriptors: *Sprinkler irrigation, *Lawns, *Distribution patterns, *Wyoming, *Application rates, *Christiansen's Uniformity Coefficient.

Distribution patterns of six typical lawn sprinkler types were determined during the summer of 1977. Tests were conducted on four sprinklers from each type under three pressure levels. Christiansen's Uniformity Coefficient (UCC) was calculated for the original pattern and for each of nine different overlaps of the sprinklers. Overlaps required to achieve minimum acceptable UCC values were then determined. The output of each sprinkler was measured and application rates were calculated for individual pattern sizes at the three pressure levels. Two important factors for effective lawn watering include: (1) usage of the proper overlap for an individual sprinkler type, and (2) determination of the application rate in order to apply the proper amount of water for a given soil type.
W79-02155

HIGH PLANS - OGALLALA GROUNDWATER STUDIES,
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 4B.
W79-02172

RECIPROCABLE SPRINKLER,
G. Brandl.
U.S. Patent No. 4,109,866, 4 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2197, August 29, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation practices, Irrigation efficiency, Application equipment, Water delivery.

A sprinkler designed to irrigate a certain sector of the ground comprises an upward sloping barrel which rotates about a vertical axis and which terminates in a nozzle. It carries two vertically oscillatable arms that are alternately effective to drive the barrel on a forward swing and on a return swing under the impact of the emitted water spray. The reverse-driving arm has a deflecting head which, on the return swing, lies in line with the nozzle and has two hands adjoining each other at an obtuse angle, i.e. a ramp face sloping upward in a radially outward direction and a reaction face of larger area including an acute horizontal angle with the radial direction. When the head is lowered into the path of the spray by an end stop, the impact of the water upon the ramp face pulls the reaction face into line with the nozzle against the force of a restoring spring. Another such spring, including a lost-motion connection, goes into effect in a position in which the spray impinges squarely upon the reaction face, thus tending to hold that face aligned with the nozzle but allowing the head to yield under excessive water pressure. (Sinha-OEIS)
W79-02318

THE MICRO-CLIMATE OF NARROW- AND WIDE-ROW SORGHUM WITH EQUAL PLANT DENSITIES,
Kansas State Univ., Manhattan. Evapotranspiration Lab.
For primary bibliographic entry see Field 2D.
W79-02358

WIND, SPRINKLER PATTERNS, AND SYSTEM DESIGN,
Technion-Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
I. Seginer, and M. Kostrinsky.
Journal of the Irrigation and Drainage Division, Proceedings of ASCE, Vol. 101, No. IR4, p 251-264, December 1975. 8 fig, 3 tab, 6 ref.

Descriptors: *Sprinkler irrigation, *Wind velocity, *Irrigation, *Irrigation design, *Irrigation efficiency, *Distribution patterns.

The study concludes that: (1) Due to the fact that wind speed and solar radiation were not correlated in the data on which this study was based, it was possible to show that the wind speed was not directly contributing to the water loss during sprinkling. (2) A method of sprinkler patterns reconstruction was developed, which yielded representative interpolated patterns, as well as reliable extrapolated patterns for no-wind conditions. (3) It was theorized and demonstrated that when the centers-of-mass of consecutive distribution patterns are equidistant, the water distribution is likely to be the optimal that can be achieved under the major constraints of the system. (Skogerboe-Colo St)
W79-02368

DIFFERENTIAL EFFECT OF BERMUDA AND BAHIAGRASSES ON SOIL CHEMICAL CHARACTERISTICS,
Georgia Univ., Athens. Dept. of Agronomy.
K. H. Tan, E. R. Beaty, R. A. McCreery, and J. B. Jones.
Agronomy Journal, Vol. 67, No. 3, p 407-411, May-June, 1975. 5 fig, 2 tab, 20 ref.

Descriptors: *Grasses, *Forage grasses, Forages, *Organic matter, Crop response, *Soil chemical properties, Soil chemistry, Nitrogen, Fertilization, *Bermudagrass, *Bahiagrass.

The use of bermudagrass and bahiagrass has attracted considerable research attention with respect to forage production. Little information is available on the influence of these grasses on soil properties; and a direct comparison to effectively estimate the differential effect of bermudagrass and bahiagrass on major soil chemical properties is still lacking. A randomized split plot experiment was carried out in three replicates using a Montevalo soil planted with several bermudagrass and bahiagrass varieties, receiving annual application of 0, 224, and 672 kg N per ha from 1967 to 1970. In 1971 herbage and soil samples were collected for yield and chemical analysis. The results indicated the absence of differences in the effects of the grasses on soil pH, N, P, K, and Ca, but there were differences in organic matter contents. (Skogerboe-Colo St)
W79-02381

DESALINATION IN THE REUSE OF INDUSTRIAL WASTE WATER,
Water Reuse Promotion Center, Tokyo (Japan).
For primary bibliographic entry see Field 5D.
W79-02383

ADVECTION MODIFICATION OF THE PRIESTLEY AND TAYLOR EVAPOTRANSPIRATION FORMULA,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 2D.
W79-02395

YIELD OF DRYLAND GRAIN SORGHUM AS AFFECTED BY ANTITRANSPIRANT, NITROGEN, AND CONTRIBUTING MICRO-WATERSHED,
New Mexico Agricultural Experiment Station, University Park.
H. D. Fuehring.

Agronomy Journal, Vol. 67, No. 2, p 255-257, March-April, 1975. 3 tab, 11 ref. OWRT B-029-NMEX(1).

Descriptors: *Antitranspirants, *Rain water, Surface runoff, *Drought, *Moisture stress, Sorghum, Nitrogen, Watershed management, Fertilizers, *Atroazine, Rain-water efficiency, Micro-Watersheds.

In the semi-arid Great Plains yields of grain sorghum (Sorghum bicolor(L.) Moench) are always limited by lack of rainfall or soil moisture during some part of the growing season. The purpose of this study was to determine if minimal land shaping practices in combination with antitranspirant application would increase yield levels of dryland grain sorghum. Variables were width of watershed, width of growing bed, applied N, and foliarly applied antitranspirant combined in a central composite experimental design. Use of contoured compacted bare micro-watersheds increased grain sorghum yields of adjacent growing beds considerably even in two relatively wet years. However, yields of the entire area (growing bed plus watershed) decreased. Atrazine (2-chlor-ethylamino-6-isopropylamino-s-triazine) as an antitranspirant at 0.2 to 0.3 kg/ha effectively increased sorghum grain yields under conditions of solid planting and adequate nitrogen. The antitranspirant-nitrogen interaction was especially positive under conditions of moisture stress. Since most grain sorghum is grown under conditions where moisture stress is likely, further work on the use of antitranspirants is warrented in order to establish the conditions of response.
W79-02403

PHYSIOLOGICAL ASPECTS OF WATER USE EFFICIENCY,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 2I.
W79-02449

YIELD RESPONSE TO SOIL WARMING: AGRONOMIC CROPS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
K. A. Rykbost, L. Boersma, H. J. Mack, and W. E. Schmisseur.
Agronomy Journal, Vol 67, p 733-743, Nov-Dec 1975. 7 fig, 2 tab, 9 ref. OWRT B-039-ORE(5) and B-044-ORE(2).

Descriptors: Reject energy, *Soil temperature, *Crop response, Cooling water, Heated water, *Waste heat.

Waste heat appears in the form of warm condenser cooling water from power generating plants. It has been proposed to use this water with temperatures ranging from 25 to 40C for warming soils by pumping it through buried pipes. Experiments were conducted to determine the effect of warming soils in this manner on the growth rates and yields of several crops. The proposed system was simulated with parallel electrical heating cables buried 92 cm deep and 183 cm apart. Heat source temperatures ranged from 35 to 38C during the growing period. Heating increased the average temperature of the soil layer from 0 to 100 cm deep by about 10C. The average temperature increase of the 0 to 10 cm soil layer was < 3C. The crops tested were field corn (Zea mays L.), sudangrass (Sorghum vulgare sudanese), sughum-sudangrass hybrid (Sorghum bicolor L.), and tall fescue (Festuca arundinacea). The yield increases, expressed as percentages of yields obtained on unheated plots, ranged from 19% for tall fescue to about 50% for sudangrass. The yield increases varied widely from year to year for the same crop. The highest yield increases occurred during years when the yields on unheated plots were lowest. Correlations between yield increases and yields from unheated plots were highly significant. A yield decrease occurred only with tall fescue during the summer. Soil heating appears to be most effective when climatic conditions and management factors are limiting. The effects of higher soil temperatures on growth rates were greatest in the early spring.
W79-02490

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE EFFECTS OF WEED-CUTTING ON THE MACRO-INVERTERATE FAUNA OF A CANALISED SECTION OF THE RIVER HULL, A NORTHERN ENGLISH CHALK STREAM,
James Cook Univ. of North Queensland, Townville (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-02002

AQUATIC PLANT MANAGEMENT IN SEMI-NATURAL STREAMS: THE ROLE OF MARGINAL VEGETATION,
Freshwater Biological Association, East Stoke (England). River Lab.
For primary bibliographic entry see Field 5G.
W79-02012

THE ECONOMICS OF WATER CONSERVATION,
East Bay Municipal Utility District, Oakland, CA.
For primary bibliographic entry see Field 3D.
W79-02022

STUDYING THE ECONOMICS OF A WATERWAY: A CRITIQUE OF STUDIES OF THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-02052

THE OCCURRENCE AND REMOVAL OF NITROGEN IN SUBSURFACE AGRICULTURAL DRAINAGE FROM THE SAN JOAQUIN VALLEY, CALIFORNIA,
California Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W79-02107

FORESTED WETLANDS OF FLORIDA-THEIR MANAGEMENT AND USE,
Georgia State Univ., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 6B.
W79-02112

SOME COMPARISONS OF FLOOD STATISTICS IN REAL AND LOG SPACE,
Geological Survey, Reston, VA. Water Resources Div.; and IBM Thomas J. Watson Research Center, Yorktown Heights, NY.
For primary bibliographic entry see Field 2E.
W79-02119

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02121

FLOW CHARACTERISTICS OF STREAMS IN TUTUILA, AMERICAN SAMOA,
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-02124

ESTIMATES OF 7-DAY, 10-YEAR MINIMUM FLOWS AT SELECTED STREAM SITES IN PUERTO RICO,
Geological Survey, San Juan, PR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02125

MAGNITUDE AND FREQUENCY OF FLOODING ON THE MYAKKA RIVER, SOUTHWEST FLORIDA,
Geological Survey, Tallahassee, FL., Water Resources Div.
K. M. Hammett, J. F. Turner, Jr., and W. R. Murphy, Jr.
Water-Resources Investigations 78-65 (open-file report), 1978. 40 p, 15 fig, 8 tab, 11 ref.

Descriptors: *Flood plains, *River basin development, *Watershed management, *Flood control, *Flood profiles, Flood peak, Flood frequency, Flood routing, Dikes, Flood forecasting, Analytical techniques, *Florida, *Myakka River basin(FL), Sarasota County, Manatee County.

Increasing numbers of urban and agricultural developments are being located on waterfront property in the Myakka River flood plain in southwest Florida. Under natural conditions, a large depression, Tatum Sawgrass, was available as a flood storage area in the upper Myakka River basin. Construction of dikes across the lower part of Tatum Sawgrass has restricted use of the depression for temporary storage of Myakka River flood water overflow, and has resulted in increased flood-peak discharges and flood heights in downstream reaches of the Myakka River. The difference between natural and diked condition flood-peak discharges and flood heights is presented to illustrate the effects of the dikes. Flood-peak discharges, water-surface elevations and flood profiles also are provided for diked conditions. Analytical procedures used to evaluate diking effects are described in detail. The study reach includes Myakka River main stem upstream from U.S. Highway 41, near Myakka Shores in Sarasota County, to State Road 70 near Myakka City in Manatee County (including Tatum Sawgrass and Clay Gully), and Blackburn Canal from Venice By-Way to Myakka River. (Woodard-USGS)
W79-02129

FLOOD-PLAIN DELINEATION FOR CUB RUN BASIN, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-02137

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 1. WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02138

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02139

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1977.
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02140

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1977.
Geological Survey, Doraville, GA.. Water Resources Div.

For primary bibliographic entry see Field 7C.
W79-02141

INCREASING EFFICIENCY OF AQUATIC PLANT MANAGEMENT THROUGH PROCESSING,
Wisconsin Univ.-Madison. Water Resources Center.
R. G. Koegel, S. H. Sy, H. D. Bruhn, and D. F. Livermore.
Hyacinth Control Journal Vol. 11, p. 24-30, June 1973. 9 fig, 3 tab, 13 ref. OWRT B-058-WIS(2), 14-31-0001-3665.

Descriptors: *Harvesting, *Aquatic weed control, *Mulching, *Mechanical equipment, *Treatment, Feed, *Wisconsin, Dane County(Wis).

While mechanical harvesting is generally considered an ecologically sound approach to the control of excessive aquatic plant growth, its application has been limited by high unit costs. The efficiency of mechanical harvesting can be greatly increased by (1) reducing the weight, (2) reducing the volume, and (3) improving the handling characteristics of the harvested plant material by means of processing. Possibilities for utilization and disposal of harvested aquatic plants are also dicussed.
W79-02158

CONTROL OF 1973 MISSISSIPPI RIVER FLOOD,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Lower Mississippi Valley Div.
R. I. Kaufman.
Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers, Vol. 104, No. WR1, Proceedings Paper 14169, p 105-121, November 1978. 4 fig, 1 tab, 4 ref.

Descriptors: *Mississippi River, *Floods, *Illinois, *Gulf of Mexico, Flood control, Hydraulics, Levees, Rivers, Seepage, Waves(Water), Flood damage, *Mississippi River flood, Flood control plan.

In 1973 a major flood occurred on the Mississippi River. Much of the alluvial valley of the river between Alton, Illinois, and the Gulf of Mexico is protected against floods by Federally constructed flood control works. As some of these systems were not complete at the onset of the flood, a major flood fight was required to safeguard the valley. Miles of levee had to be raised to provide proper protection. Other problems requiring flood-fight efforts were seepage under levees, scour at levees and structures, and riverbank failures. Even though major emergency efforts were required, the Federal flood control systems were effective and of great value in controlling the flood. The projects prevented the inundation of 26,000 sq miles (67,500 sq km) of land and reduced flood damages by over $14,000,000,000. However, the losses sustained indicate the need to complete authorized works and possibly expand existing projects or initiate new projects in some areas, or both. (Lee-ISWS)
W79-02195

FORECAST OF THE FLASH FLOOD HYDROGRAPH ON THE INGODA RIVER,
V. A. Bel'chikov.
Soviet Hydrology: Selected Papers, Vol 16, No 1, p 21-25, 1977. 3 fig, 2 tab, 6 ref. Translated from Transactions of the Hydrometeorological Scientific Research Center of the USSR (Trudy GMTs), No. 183, p 56-65, 1977.

Descriptors: *Flood forecasting, *Flash floods, *Hydrograph analysis, *Mathematical models, Runoff forecasting, Water levels, Rivers, Hydrographs, Rainfall-runoff relationships, Infiltration, Evaporation, Foreign research, Foreign countries, Analytical techniques, Precipitation(Atmospheric), Discharge(Water), Floods, *USSR, *Ingoda River(USSR).

The results of the use of a mathematical model of flash flood formation in developing a method of short-range forecasting the runoff hydrograph for the Ingoda River basin (upstream of Chita city) were reported. The mountain topography, relatively steep slopes, and a developed river network promote the rapid discharge of rainwaters into the main channel network and the formation of high floods. Flash floods with brief and sharp rises and drops in level are fairly frequent. Data on discharges, precipitation, and the atmospheric moisture deficit for the period from 1952 to 1971 were used to develop a method of short-range flash flood forecasting. Since operational information contains only stage data, discharge curves were used. An estimate of the control forecasts lead to the conclusion that the developed model can be used by means of a computer to issue continuous short-range forecasts of flash flood discharges 36 hours in advance. Computations on the basis of observations in the Ingoda reach in question from 1952 to 1971 showed that the computed and actual discharges agreed very well. (Humphreys-ISWS)
W79-02207

COMPLEX RELATIONS BETWEEN THE HYDROLOGIC BUDGET OF THE MAJOR GEOGRAPHIC ZONES OF THE EARTH,
Akademiya Nauk SSSR, Moscow. Inst. Geografii.
For primary bibliographic entry see Field 2A.
W79-02208

GEOGRAPHIC ASPECTS OF THE TERRITORIAL REDISTRIBUTION OF WATER RESOURCES,
Akademiya Nauk SSSR, Moscow. Inst. of Geografii.
M. I. L'vovich.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 38-47, 1977. 3 fig, 1 tab. Translated from News of the USSR Academy of Sciences, Geographic Series (Izvestiya Akad. nauk SSSR. Ser. geogr.), No. 2, p 22-37, 1977.

Descriptors: *Water resources development, *Planning, *Water transfer, *Inter-basin transfer, Diversion, Spatial distribution, Geographical regions, Runoff, Rivers, Withdrawal, Water quality, Reservoirs, Water importing, Foreign countries, *USSR.

The principles of a scientific concept developed under the guidance of the author and reported at the Scientific Council of the Institute of Geography, USSR Academy of Sciences, were described. The general scientific and economic permises of the redistribution of water resources in the USSR, including some alternatives, were analyzed. The experience gained in the construction of one of the largest hydraulic engineering complexes, the Volga-Kama cascade of reservoirs, was discussed. General considerations were presented on the need and possibilities of using additional freshwater in southern regions in relation to the prospects for their development. Particular attention was given to the intensification of water management and to water quality, and the geographic aspects of investigations in this field were outlined. (Humphreys-ISWS)
W79-02209

MECHANISM OF FORMATION AND FORECAST OF THE DEVELOPMENT OF THE VOLGA DELTA,
For primary bibliographic entry see Field 2J.
W79-02210

SEICHES IN THE BALTIC SEA AND THEIR EFFECT ON FLOODS IN THE NEVA RIVER DELTA,
For primary bibliographic entry see Field 2L.
W79-02213

THE COLONIZATION OF CABORA BASSA, MOCAMBIQUE, A NEW MAN-MADE LAKE, BY FLOATING AQUATIC MACROPHYTES,
Loxton, Hunting and Associates, Gaberone (Botswana).
W. J. Bond, and M. G. Roberts.
Hydrobiologia, Vol. 60, No. 3, p 243-259, 1978. 5 fig, 7 tab, 23 ref.

Descriptors: *Lake Cabora Bassa(Mocambique), *Impoundments, *Floating plants, *Aquatic weed control, *Water hyacinth, *Salvinia molesta, Vegetation establishment, Mozambique, Lakes, Artificial lakes, Eichhornia crassipes, Drawdown, Nutrients, Eutrophication, Water pollution effects, Lake Kariba(Mocambique), Zambezi River, Limiting factors, Succession, Pistia stratiotes, Hydroelectric plants, Multiple-purpose projects, Macrophytes, Pesticides, Mechanical control, Insects.

Predicted extensive macrophyte growth by the floating weeds Salvinia molesta and Eichhornia crassipes (water hyacinth) during filling of Lake Cabora Bassa (Mocambique), a new impoundment of the Zambezi River, had not occurred by the end of 1975. Filling begun in December 1974, was very rapid and surface currents carried large quantities of weed to the outflow at the lake's eastern end. When lake levels stabilized, macrophytes were concentrated in the extreme east and west, with scattered mats on northern shores of the central basins. The Carinde narrows at the western end impeded weed passage, particularly after surface currents ceased and easterly winds dominated plant dispersal. Storm-related winds at the end of the year led to some redistribution of the largely stable mats. Not more than 1% of the surface area was ever covered by floating macrophytes. Initially, Salvinia, Eichhornia, and Pistia stratiotes were present in large quantities, then Salvinia was rapidly suppressed by Pistia, and then both species by Eichhornia, which was completely dominant by the end of the year. Eichhornia grew rapidly until September when rates diminished, and in Gorge Basin signs of nutrient deficiency developed. By the end of 1975 no offsets were being produced by Eichhornia for unknown reasons. Rapid drawdown in july 1975 destroyed nearly 50% of the weed mats, and two insects may have helped control populations. Harvesting and pesticides eliminated weeds in the central basins and parts of the Gorge Basin. Results are contrasted with Lake Kariba. (Lynch-Wisconsin)
W79-02231

ECONOMIC IMPACT OF ALTERNATIVE STORMWATER DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D.
W79-02289

PROFILE AND MEASUREMENT OF SOCIAL WELL-BEING INDICATORS FOR USE IN THE EVALUATION OF WATER AND RELATED LAND MANAGEMENT PLANNING,
Texas Transportation Inst., College Station.
For primary bibliographic entry see Field 6B.
W79-02344

REMOTE SENSING TECHNIQUES AND THE MONITORING OF DESERTIFICATION PROCESSES IN ARID AREAS,
Desert Inst. Ashkhabad (USSR).
For primary bibliographic entry see Field 7B.
W79-02390

ESTABLISHMENT OF NATIVE PLANTS FOR THE REHABILITATION OF PARAHO PROCESSED OIL SHALE IN AN ARID ENVIRONMENT,
Utah State Univ., Logan. Inst. for Land Rehabilitation.
C. M. McKell.
In: The Reclamation of Disturbed Arid Lands, ed. by R. A. Wright. University of New Mexico Press, Albuquerque, p 13-32. 1978. 1 tab, 2 fig, 55 ref.

Descriptors: *Oil shales, *Revegetation, *Baseline studies, *Land reclamation, Infiltration, Rainfall-runoff relationships, Water yield, Range manage-

ment, Soil surfaces, Rocky Mountain region, Vegetation establishment, Soil stabilization.

Oil shale deposits, a large potential energy source, are found in Colorado, Utah, and Wyoming. Although their exploitation has yet to reach commercial stage, government officials, in anticipation, have begun to develop techniques for the rehabilitation of areas disturbed by such exploitation. Accordingly, 5000-acre tracts of Federal land in Utah and Colorado were leased for prototype oil shale development. A baseline data gathering program began in 1975 on these tracts and has subsequently identified many potential problems. In the Uinta Basin in northeastern Utah and to set forth techniques suitable for the establishment of native shrubs in these areas. Basic components include: (1) use of native plant species, (2) transplanting container-grown plants to avoid direct seeding, (3) soil surface shaping to induce runoff and terraces to increase infiltration, (4) soil surface stabilization to promote runoff and reduce soil particle movement, (5) topsoil use limited to trenches where plants can be grown, (6) fertilizer application only in required amounts, and (7) supplemental irrigation. Actual operation may require modification of these techniques. (Tickes-Arizona)
W79-02391

A HYDRAULIC INSTALLATION IN THE WATER SUPPLY SYSTEM OF EMMAUS-NICOPOLIS,
Hebrew Univ., Jerusalem (Israel).
Y. Hirschfeld.
Israeli Exploration Journal, Vol 28, No 1-2, p 86-92, 1978. 4 fig, 17 ref.

Descriptors: *Aqueducts, *Paleohydrology, *History, *Conveyance structures, Dating, Water resources development, Archaeology, Diversion structures, Hydrologic aspects, Structural analysis, Adaptation, Architecture, Masonry, Israel.

The construction and operation of the recently excavated water supply system of the ancient Roman city of Emmaus is described. The system is composed of sophisticated installations for groundwater collection, including two parallel aqueducts built on two separate sources of water: the upper is a masonry tunnel approximately 25 meters long, penetrating horizontally and collecting the water at ground level. The tunnel, .30 m wide and 1.20 m high is built of ashlar and contains two inspection shafts; the lower channel runs from a stone craft which penetrates vertically to the groundwater, an example of a subterranean artificial spring feeding a water supply system. This aqueduct, built completely underground, is composed of three elements: an artificial spring, a vaulted room that protects it, and an approach shaft from the surface. Based on archeological and historical evidence, it is assumed that this hydraulic installation was constructed in the fifth century A.D. Systems similar to this one have been uncovered in several eastern Roman cities dating from the third to the fifth centuries A.D. Architecturally, these systems are characteristic of Roman construction in the eastern parts of the empire and utilize the ashlar masonry technique. (Tickes-Arizona)
W79-02394

THE WATER SUPPLY SYSTEM OF CAESAREA MARITIMA,
For primary bibliographic entry see Field 8B.
W79-02399

EVALUATION MODELS FOR PUBLIC MANAGEMENT OF FRESHWATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 6B.
W79-02401

IDENTIFICATION AND DELINEATION OF FRESHWATER WETLAND VALUES,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 6B.
W79-02402

WETLAND ROAD CROSSING: DRAINAGE PROBLEMS AND TIMBER DAMAGE,
Forest Service (USDA), St. Paul MN. North Central Forest Experiment Station.
For primary bibliographic entry see Field 4C.
W79-02421

STOCHASTIC MODELING FOR PREDICTING FREQUENCY DISTRIBUTION OF STAGES IN THERMAL LAKES AT FUTURE PLANNING HORIZONS,
Utah Water Research Lab., Logan.
L. D. James, D. S. Bowles, and S. J. Burges.
In: Desertic Terminal Lakes, Proceedings of the International Conference on Desertic Terminal Lakes. Weber State College, Ogden, Utah, Deon C. Greer, Ed. Utah Water Research Lab. Publication. Sept 1977. OWRT B-153-UTAH(1), 14-34-0001-8122.

Descriptors: *Stochastic models, *Frequency distribution, *Lake stages, Planning, *Forecasting, Model studies, Land use, *Desertic terminal lakes.

Planners and engineers responsible for dealing with fluctuating terminal-lake water levels in planning land use along terminal-lake shorelines, or for water resources management in terminal-lake basins need information on stage-frequency and how it is affected by their plans. Comparison of the alternative methods for deriving the needed relationships finds stochastic modeling (operational hydrology) techniques superior. The method (1) develops a stochastic model that preserves the distributional and persistence properties of the historical sequences of surface inflow, groundwater inflow, precipitation on the lake, and evapotranspiration, (2) inputs generated sets of these four sequences to a water balance model to estimate corresponding sequences of lake stage commencing at the known present lake level, and (3) analyzes these sequences to establish lake stage-frequency distributions at each year to some planning horizon. By using rainfall-runoff relationships to adjust inflows, and method estimates how variations in land and water use in the tributary basin affect lake stage.
W79-02495

4B. Groundwater Management

PUBLIC GROUNDWATER SUPPLIES IN KANE COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller, and E. W. Sanderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 617, Price codes: A05 in paper copy, A01 in microfiche. ISWS Bulletin 60-22, 1978. 92 p, 3 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, Unconsolidated aquifers, Well data, Gravels, Sand aquifers, Bedrock, Sandstones, Dolomite, Groundwater availability, Groundwater, Hydrology, Hydrogeology, Water sources, Water quality, Water wells, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Deep wells, Shallow wells, Geology, Aquifers, *Kane County(Ill), Dissolved minerals, Water bearing formations.

All available information on production wells used for public water supplies in Kane County, Illinois, was presented. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. The report included separate descriptions for 34 public water supply systems furnishing water to 16 municipalities, 14 subdivisions, and 4 state institutions in Kane County. These were preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for public use. Individual production wells for each supply were described in the order of their construction. The description for each well included the aquifer or aquifers tapped, data drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses.(Humphreys-ISWS)
W79-02075

GEOLOGY AND GROUNDWATER RESOURCES OF NORTHERN BERKS COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02132

CHEMICAL QUALITY OF GROUND WATER IN FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Fairfax, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02133

MAJOR AQUIFERS IN CLARK COUNTY, SOUTH DAKOTA,
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02134

POTENTIAL FOR DOWNWARD LEAKAGE TO THE FLORIDAN AQUIFER, GREEN SWAMP AREA, CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02136

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 1. WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02138

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02139

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1977.
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02140

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1977.
Geological Survey, Doraville, GA., Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02141

GEOPHYSICAL DELINEATION OF BURIED GLACIAL RIVER VALLEY AQUIFERS IN GRUNDY COUNTY, MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W79-02154

TWO DRILLING METHODS COMPARED,
Schultes (A. C.) and Sons, Inc., Woodbury, NJ.
For primary bibliographic entry see Field 8B.
W79-02169

HIGH PLANS - OGALLALA GROUNDWATER STUDIES,
Kansas Water Resources Board, Topeka.

J. A. Power, Jr.
(1978) Kansas Water News, Vol. 21, No. 1 and 2, p 4, 46-47.

Descriptors: *Aquifer management, *Groundwater, Investigations, *Model studies, Evaluation, Management, Computer models, Oil, Water supply, Overdraft.

The Ogallala - High Plains economy is being threatened by lowering of the water table and declining petroleum production. Economic disaster can be averted by regional investigations. The Economic Development Administration - High Plains Council Study is a multi-agency, six-state study of the declining water resources of the Ogallala. Its objectives are: (1) determine development alternatives; (2) identify and describe policies and actions for carrying out development strategies, and (3) evaluate local, state and national implications of these alternative development strategies. The U.S. Geological Survey-Ogallala Study is a four-year study of the High Plains aquifer system. Its objectives are to: (1) Describe the quantity and quality of water resource and the hydrologic budget; (2) Develop a regional water resources data storage and retrieval system; (3) Develop data collection networks to monitor future water use, water quality changes and water storage changes; (4) Design and develop digital computer models of the aquifer system; (5) Demonstrate the applicability of the models and provide a hydrologic basis for the economic evaluation of management alternatives. Computer models of the High Plains aquifer system will predict the future state of the system with a given knowledge of future stress. They will be a vital tool in groundwater management. (Purdin-NWWA)
W79-02172

MODEL AIDS PLANNERS IN PREDICTING RISING GROUND-WATER LEVELS IN SAN BERNADINO, CALIFORNIA,
Geological Survey, Laguna Niguel, CA.
W. F. Hardt, and C. B. Hutchinson.
Ground Water, Vol. 16, No. 6, p 424-431, November-December, 1978. 9 fig, 9 ref.

Descriptors: *Water levels, *Artificial recharge, *Mathematical models, *Groundwater, Natural recharge, Pumping, Monitoring, Water management(Applied), Artesian heads, *California, *San Bernadino(Calif).

Problems in the orderly development of the current water-management program in the San Bernadina Valley could result from imported water from Northern California recharging the ground water system. Intensive agricultural development in this area led to a decline in artesian water levels from 50 feet or more above land surface to 50-150 feet below land surface. If the artesian head were to again extend above land surface due to artificial recharge, buildings, public works and utilities could be damaged. A mathematical well-response model was developed by Durbin and Morgan to predict water-level changes that would occur in selected wells due to artificial recharge. In this study, a conceptual model of the flow mechanics and geologic framework of the basin was first developed. Then, using the data from the analysis of conceptual model, a mathematical model was devised to represent the prototype. The solution to the problem is based on the combined influence of natural recharge, artificial recharge, and groundwater pumping. The greatest unknown is the quantity and distribution of natural recharge. Artificial recharge and pumpage can be controlled. In addition to the predictive mathematical model, key monitoring wells are located between the recharge sites and the former swampy area to reflect the effects of the recharge program. (Purdin-NWWA)
W79-02173

THE NEED FOR PROFESSIONALISM AND ITS ATTRIBUTES IN HYDROGEOLOGY,
For primary bibliographic entry see Field 6E.
W79-02174

SURFACE WATER VS. GROUND WATER,
National Water Well Associaton, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol. 30, No. 12, p 26-27, December, 1978.

Descriptors: *Groundwate, *Surface water, *Water utilization, Economics, Water treatment, Aquifers, Reservoirs, Reliability.

Although ground water accounts for 95 percent of the U.S. fresh water supply, only 25 percent of our total water needs are being met through the use of ground water. This is strange in view of the fact that ground water usually can be developed and produced cheaper and faster than surface water. Operation and maintenance costs for ground water systems are up to 40 percent lower than surface water systems. Aquifers are better than surface reservoirs in that they are not subject to water loss or flooding. Also, they are protected from contamination by airborne particulate matter, organic matter and algae growth. New regulations under the Safe Drinking Water Act will probably raise surface water treatment costs but not ground water. Surface water supplies have been promoted by special interest groups for various monetary and political reasons. Ground water is a superior product and in this era of broader political and economic awareness it should be recognized as such and given precedence over surface water. (Purdin-NWWA)
W79-02176

IMPROVED TECHNIQUES FOR EVALUATING CARBONATE WATERFLOODS IN WEST TEXAS,
Exxon Co., Houston, TX.
C. J. George, and L. H. Stiles.
Journal of Petroleum Technology, Vol. 30, No. 11, p 1547-1553, November, 1978. 12 fig, 1 tab, 5 ref.

Descriptors: *Water flooding, *Oil reservoirs, *Injection, Oil wells, Injection wells, *Texas, *Waterfloods.

Detailed studies of three waterfloods in Permian carbonate reservoirs of west Texas resulted in new depletion plans with major operating changes, including infill drilling and pattern modifications. An important aspect of these studies was the close coordination of geologic and engineering work that produced a consistent approach to the relationship between reservoir depletion and field procedures used to improve ultimate recovery. Problems in waterflooding Permian carbonates of west Texas occur basically because of the stratified nature of the pay, discontinuities, and ineffective well completions. Solutions and corrective measures to be used are derived from a good geologic description that determines the quantity and distribution of net pay, volumetric original oil in place, and floodable volume at the injector-to-producer spacing. Techniques were developed to improve the calculations of original oil in place and to better determine the relationship between floodable volume and injection pattern. This relationship was the basis for major program changes. In carbonate reservoirs volumetric original oil in place may be larger than the calculated value because of discontinuities and ineffective well completions. If so, the ratio of material balance to volumetric original oil in place can be considered a measure of reservoir continuity and effective well completions. (Purdin-NWWA)
W79-02182

INNOVATIVE WATER SYSTEM SOLVES QUALITY PROBLEM,
Tacoma Dept. of Public Utilities, WA. Water Div.
For primary bibliographic entry see Field 5G.
W79-02183

UNDERGROUND INJECTION CONTROL PROGRAM STUDIED,
For primary bibliographic entry see Field 5G.
W79-02184

SUBSURFACE STRATIGRAPHY AND WATER RESOURCES OF CASS COUNTY, INDIANA,
Purdue University West Lafayette, Indiana. Department of Geosciences.
S. D. Noel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 847, Price codes: A08 in paper copy, A01 in microfiche. Purdue Univ. Water Resources Research Center Technical Report 102. June 1978. 94 p, 17 fig, 12 tab, 41 ref, 2 append, 1 plate. OWRT C-6106 No. 5213(5).

Descriptors: *Groundwater, *Glacial aquifers, *Water wells, *Stratigraphy, Groundwater availability, Groundwater recharge, Specific yield, Radioactive dating, Geologic formations, Bedrock, Cass County(Ind), *Indiana.

The groundwater resources of Cass County, Indiana are currently underdeveloped. The glacial outwash aquifers probably are capable of supplying large amounts of good quality water for industrial, agricultural, and urban needs and may do so if the future of the resources is properly developed and managed. Aquifers are classified by their occurrence in Wisconsinan and Illinoian deposits and in bedrock. Wisconsinan aquifers in gravel are interbedded with glacial till and are of limited areal extent. Production is sufficient only for domestic needs, but large quantities are available locally. These Illinoian valley train deposits are potentially the most productive aquifers in the county. Bedrock aquifers may have relatively large production, but the depth to the aquifers and variability in yields have resulted in their use only where adequate supplies are not obtainable from shallower sources. Throughout the county, groundwater quality is good except for high iron content and hardness values. The hardness increases with depth probably reflecting the underlying carbonate bedrock. (Wiersma-Purdue)
W79-02185

FOSSIL GROUND-WATER GRADIENTS IN ARID REGIONAL SEDIMENTARY BASINS,
Birmingham Univ. (England). Hydrogeology Section.
For primary bibliographic entry see Field 2F.
W79-02189

THE BLIND ZONE IN SEISMIC GROUND-WATER EXPLORATION,
James Madison Univ., Harrisonburg, VA. Dept. of Geology.
J. E. Sander.
Ground Water, Vol. 16, No. 6, p 394-397, November-December 1978. 3 fig, 6 ref.

Descriptors: *Seismic studies, *Groundwater, *Exploration, Geophysics, Locating, Transmissivity, Aquifer characteristics, Velocity, Aquicludes, Resistivity, *Seismic refraction, *Blind zones, *Saturated thickness.

Seismic refraction methods can often indicate the saturated thickness of an aquifer. However, if an impermeable blind zone layer is present, it will not show up in the refraction profile. As a result, saturated thickness and transmissivity values indicated by the profile will be too high. Thus, it is important in many cases to look for a blind zone layer, and resistivity data combined with geological considerations are two possible ways of inferring its presence. (Visocky-ISWS)
W79-02190

TRANSIENT SPHERICAL FLOW TO A NON-PENETRATING WELL WITH CONSTANT DRAWDOWN,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Agricultural Engineering.
C. S. Jaiswal, and H. S. Chauhan.
Ground Water, Vol. 16, No. 6, p 432-436, November-December 1978. 3 fig, 1 tab, 11 ref.

Descriptors: *Wells, *Water wells, *Drawdown, *Pumping, *Model studies, Mathematical models.

Aquifers, Theoretical analysis, Equations, Hydraulic conductivity, Impervious soils, Confined water, Groundwater, Groundwater movement, Observation wells, Hydrology, *Nonpenetrating wells.

Flow to a flowing nonpenetrating well in a leaky artesian aquifer was analyzed. A method was suggested to determine the aquifer parameters using the pump-test data on such wells with constant drawdown in the well. A technique also was suggested to determine the aquifer parameters using the well itself as the observation well. (Sims-ISWS)
W79-02191

THE IMPACT OF THE USE OF HEAT PUMPS ON GROUNDWATER TEMPERATURES,
Northern Cheyenne Research Project, Lame Deer, MT.
C. B. Andrews.
Ground Water, Vol. 16, No. 6, p 437-443, November-December 1978. 6 fig, 2 tab, 16 ref. EPA R803971020.

Descriptors: *Heat pumps, *Wisconsin, *Groundwater, *Water temperature, *Model studies, Mathematical models, Heat transfer, Heat flow, Temperature, Groundwater movement, Aquifers, Energy, Energy transfer, Hydraulic conductivity, Dispersion, Seasonal, Heating, Cooling, Hydrology, Groundwater heat pumps.

The impact of the use of a heat pump for residential heating and cooling on groundwater temperatures was simulated by means of a mathematical model which couples the equations for groundwater flow with those for heat transport. A hypothetical case using data typical for southern Wisconsin was considered. Water was pumped from a recharged to a sandstone aquifer using a two-well system. Water was withdrawn from a deep well and injected into a shallow well during the heating cycle, and during the cooling cycle the system was operated in reverse. After 10 years of operation, water temperatures in the aquifer had changed less than one degree centigrade at a distance of greater than 40 meters from the wells. For the case considered, the use of heat pumps for residential heating and cooling would not adversely lower groundwater temperatures if use were restricted to sparsely populated areas. It was recommended that statutes which prohibit the injection of water directly into the subsurface be changed to allow the use of groundwater heat pumps. (Sims-ISWS)
W79-02192

ROLE OF GROUND WATERS IN THE FORMATION OF THE TOTAL RUNOFF OF A SMALL DRAINAGE BASIN IN THE FOREST ZONE,
E. A. Zal'tsberg.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 61-63, 1977. 1 fig, 1 tab, 7 ref. Translated from News of the All-Union Geographic Society (Izvestiya VGO), Vol. 109, No. 1, p 85-90, 1977.

Descriptors: *Base flow, *Runoff, *Small watersheds, *Groundwater, Watersheds(Basins), Forest watersheds, Hydrology, Discharge(Water), Foreign countries, Foreign research, Subsurface waters, On-site investigations, Hydrogeology, Hydrologic cycle, Analytical techniques, Analysis, *USSR.

To study the groundwater regime and budget, the northwestern hydrogeological party of the Northwestern Geological Survey and the Valday Hydrologic Scientific Research Laboratory have organized obsevations at three gaging stations and at a single cluster of wells near Krestovaya village in the central part of a small (432 sq km) drainage basin. Each line consists of 2-4 wells 5-8 m deep. The lines of the gaging stations are perpendicular to the direction of groundwater flow. The depth to groundwater is 0-1.5 m in loams and 1.5-3.5 m in sands and loamy sands, as a rule. Because of the general characteristics of atmospheric circulation in the northwestern region, the annual groundwater level regime in the Polomet' River basin is distinctly seasonal with two maxima (spring and autumn) and two minima (pre-spring and summer-autumn) and corresponding rises in spring and autumn and drops in winter and summer. The groundwater runoff of the investigated basin in the upper course of the Polomet' River plays an important role in the formation of total river runoff in winter and summer, when its proportion may reach 60-100%. Its role is relatively small during the spring and autumn flood periods. The quantitative characteristics obtained can be used to describe the role of groundwater in the total runoff of other small rivers of the forest zone, the basins of which are under similar climatic, geological, and hydrogeological conditions. (Humphreys-ISWS)
W79-02211

LONG-PERIOD GROUND-WATER REGIME IN THE EXCESSIVELY WET ZONE OF THE EUROPEAN USSR,
For primary bibliographic entry see Field 2F.
W79-02212

AN EVALUATION OF ISOTOPE CONCENTRATIONS IN THE GROUND WATER OF SAUDI ARABIA,
Geological Survey, Riyadh (Saudi Arabia). Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02254

GROUND WATER...CALIFORNIA'S PRICELESS RESOURCE,
California Dept. of Water Resources, Sacramento.
R. S. Ford.
California Geology, Vol 31, No 2, p 27-32, Feb 1978. 7 fig, 4 ref.

Descriptors: *Groundwater, *Overdraft, *California, Groundwater mining, Hydrologic cycle, Water table, *Specific yield, Water storage, Water quality, Springs, Drilling, Rotary drilling, Data collections.

Although forty percent of California is composed of valley areas underlain with groundwater, those reserves are presently being over-exploited, with water tables falling as much as 10 m per year in some areas. To explain the problem to the general public, this author provides here a brief explanation and discussion of the geologic framework within which the State's groundwater is stored, characteristics of movement, physical properties, and methods of extraction, including definitions useful for the layman of (1) the hydrologic cycle (zone of groundwater, perched groundwater, sustained yield, storage capacity, and hydraulic flow), (2) quality, (3) springs, (4) water well construction, and (5) groundwater data. (Tickes-Arizona)
W79-02392

LAND SUBSIDENCE DUE TO WATER WITHDRAWAL IN THE VICINITY OF PECOS, TEXAS,
Cornell Univ., Ithaca, NY. Dept. of Engineering; and Cornell Univ., Ithaca, NY. Dept. of Applied Physics.
M. J. Rosepiler, and R. Reilinger.
Engineering Geology, Vol. 11, No. 4, p 295-304, Dec. 1977. 4 fig, 1 tab, 10 ref.

Descriptors: *Land subsidence, *Subsidence, *Groundwater mining, *Water table, Geomorphology, Hydrogeology, Geological surveys, Geophysics, Sedimentology.

Land subsidence due to groundwater withdrawal is an important problem detected in several areas of the U.S. A group of researchers at Cornell University have been working with the National Geodetic Survey to determine vertical movements of the earth's crust as indicated by comparison of precise leveling surveys. This study documents a previously unreported case of subsidence in the vicinity of Pecos, Texas, where a close correlation between water level decline and land subsidence indicates that compaction of the dewatered sediments is responsible for subsidence. A system of benchmarks throughout and beyond the Pecos area was established and two sets of relative elevations for the benchmarks along two lines crossing the area were supplied by the National Geodetic Survey. An area approximately 50 km long and 30 km wide was observed to have subsided a maximum of over 200 mm. between 1935 and 1956. Water table decline during the same period was as much as 60 m, a 1:180 ratio to ground subsidence. (Tickes-Arizona)
W79-02396

DEVELOPMENT OF A STREAM-AQUIFER MODEL SUITED FOR MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 343, Price codes: A04 in paper copy, A01 in microfiche. Colorado Water Resources Research Institute, Colorado State University, Completion Report No 87, August 1978. 37 p, 4 fig, 1 tab, 11 ref, append. OWRT A-033-COLO(1). 14-34-0001-8006.

Descriptors: *Groundwater, *Surface-groundwater relationships, Regulations, Optimization, Algorithms, Model studies, *Conjunctive use, Computer models, Water levels, River forecasting, Low flow, Groundwater management, Conjunctive operation.

In most available computer models of stream-aquifer interaction, the river stages are treated as boundary conditions. However in reality for low flow conditions, the problem is the prediction of the river stages. In addition for management purposes it is essential to have explicit relations between the decision variables such as pumping rates or upstream flow releases and the resulting states of the system such as downstream river flows and aquifer drawdowns. By combining the discrete kernel approach for an isolated aquifer with the discrete kernel approach for an isolated river (treated as a cascade of Muskingum reaches) it was possible to derive the discrete kernels (influence coefficients) for all the states of interest as responses to all the relevant decision variables. The developed tool is well suited for management due to the explicit nature of the relations which make it possible to formulate the management (optimization) problem as a Mathematical Programming problem for which efficient solution algorithms exist.
W79-02450

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF FOREST WORKINGS ON STREAMFLOW AND WATER QUALITY (PART I),
Forestry and Forest Products Research Inst., Tokyo (Japan). Div. of Forest Influences.
For primary bibliographic entry see Field 5C.
W79-02005

SEDIMENTATION IN HOT CREEK IN VICINITY OF HOT CREEK FISH HATCHERY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2J.
W79-02128

COMPARISON OF THE PREDICTIVE ACCURACY OF MODELS OF URBAN FLOW AND WATER-QUALITY PROCESSES,
Geological Survey, Bay St. Louis, MS. Water Resources Div. and Geological Survey, Miami, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02253

ECOSYSTEM ANALYSES AT CORKSCREW SWAMP,
National Audubon Society, New York.
For primary bibliographic entry see Field 2I.
W79-02282

LAND USE AND INTENSIVE RANGE MANAGEMENT IN THE SIERRA NEVADA FOOTHILLS--A CONTEMPORARY ANALYSIS,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 4D.
W79-02293

INTERIM RECOMMENDATION FOR THE USE OF BUFFER STRIPS FOR THE PROTECTION OF SMALL STREAMS IN THE MARITIMES,
New Brunswick Dept. of Fisheries and Environment, Fredericton. Maritime Forest Research Center.
For primary bibliographic entry see Field 5G.
W79-02384

RANGE CATTLE IMPACTS ON STREAM WATER QUALITY IN THE COLORADO FRONT RANGE,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 5G.
W79-02386

PRECIPITATION AND RUNOFF WATER QUALITY FROM AN URBAN PARKING LOT AND IMPLICATIONS FOR TREE GROWTH,
Missouri Univ.-Columbia.
For primary bibliographic entry see Field 5B.
W79-02387

WETLAND ROAD CROSSING: DRAINAGE PROBLEMS AND TIMBER DAMAGE,
Forest Service (USDA), St. Paul MN. North Central Forest Experiment Station.
J. H. Stoeckeler.
Research Note NC-27, April, 1967. 4 p, 2 fig, 3 tab.

Descriptors: *Wetlands, *Minnesota, *Roads, *Damages, Culverts, Road construction, Lumber, Flood damage, Conduits, Conveyance structures, Surface drainage, Wetland road crossing, Timber damage.

More than half the 70 wetland road crossings observed in a northeastern Minnesota survey showed timber killed or weakened by a rise in the water table caused by the damming effect of the road. Occurrence of damage was affected by the direction of the road in relation to the contours of the land. All of the 39 crossing that showed damage were within 45 degrees of being parallel to the contour. Nearly two-thirds of the crossings over peatland showed damage compared with about one-fifth of those over mineral soil. The chief drainage problems were absence of culverts or other corss drainage, culverts set too high, no collector ditch, no discharge ditch, inadequate collector or discharge ditches, and low culvert capacity. (Steiner-Mass)
W79-02421

ECOLOGICAL EFFECTS OF HIGHWAY CONSTRUCTION UPON MICHIGAN WOODLOTS AND WETLANDS: SOIL RELATIONSHIPS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Science.
For primary bibliographic entry see Field 6G.
W79-02429

CONSEQUENCES OF SITE DISTURBANCES IN THE UPPER COASTAL PLAIN,
Southern Forest Experiment Station, Oxford, MS. Forest Hydrology Lab.
For primary bibliographic entry see Field 4D.
W79-02431

4D. Watershed Protection

TIRE MODULE SYSTEMS IN SHORE AND HARBOR PROTECTION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W79-02201

LAND USE AND INTENSIVE RANGE MANAGEMENT IN THE SIERRA NEVADA FOOTHILLS--A CONTEMPORARY ANALYSIS,
California Univ., Davis. Dept. of Agronomy and Range Science.
T. K. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 455, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis in Range Management, 1978. 91 p, 15 fig, 4 tab, 2 plates, 6 append. (California Water Resources Center Project UCAL-WRC-W-495). OWRT-B-175-CAL(4).

Descriptors: *Range management, *Erosion, Erosion control, *Environmental effects, *Land use, California, Sierra Nevada Foothills(Calif), Soil erosion, Sediments, Sedimentation.

The purpose of this investigation was to examine some range improvement practices commonly used in Sierra Nevada foothill beef cattle production. These range improvement practices can have both beneficial (food production, reduced fuel/fire danger, etc.) and adverse effects on the environment. Where adverse, measures are proposed to minimize this potential, e.g., leaving strips of trees to preserve relic habitat and to increase soil stability on a slope. Soil erosion was found to be the major category for prevention efforts, for it can be both a cause and effect of environmental degradation in rangeland. Causes of soil erosion vary from the land-clearing phase of vegetation-type conversion to overgrazing, and occasionally to access road construction. Soil erosion may result in sediment runoff to surface waters. This, in turn, may cause a detrimental impact on fishery and other beneficial uses of the waters if turbidity and dissolved oxygen depletion becomes harmful to the aquatic community. Other categories of impact include direct removal of wildlife habitat through vegetation-type conversion and indirect impacts on the cultural and biological resources. (Snyder-Calif, Davis)
W79-02293

SHOALING CONDITIONS IN SAWYER BEND AND LOWER ENTRANCE TO CHAIN OF ROCKS CANAL, MISSISSIPPI RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-02354

INTERIM RECOMMENDATION FOR THE USE OF BUFFER STRIPS FOR THE PROTECTION OF SMALL STREAMS IN THE MARITIMES,
New Brunswick Dept. of Fisheries and Environment, Fredericton. Maritime Forest Research Center.
For primary bibliographic entry see Field 5G.
W79-02384

WATER QUALITY OF STREAMFLOW FROM FORESTED WATERSHEDS ON SEDIMENTARY SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5B.
W79-02404

CONSEQUENCES OF SITE DISTURBANCES IN THE UPPER COASTAL PLAIN,
Southern Forest Experiment Station, Oxford, MS. Forest Hydrology Lab.
D. C. McClurkin, and D. M. Moehring.
Available from the Southern Forest Experiment Station. Proceedings: A Symposium on Principles of Maintaining Productivity on Prepared Sites, p 73-84. 1978. Mississippi State University, 3/21-22/78. Edited by Tom Tippin, Southern Forest Experiment Station. 48 ref.

Descriptors: Hydrologic properties, *Sediment control, *Microenvironment, *Soil erosion, *Soil physical properties, Harvesting, Forest management, Coastal plains, Federal Water Pollution Control Act, Water quality, Mississippi, *Forest practices, *Intensive site preparation, *Site productivity, Regeneration.

In the past decade, traditional methods-of-cutting for natural regeneration of southern pine have been replaced by clearcutting, intensive site preparation, and planting. Although the practice is not new to the South, never before has it been so extensive or intense; nor has it caused so much public concern. If the exhortations of the South's Third Forest (Southern Forest Resource Analysis Committee 1969) are obeyed, 10 million acres of pine will have been reforested and 20 million acres of upland hardwood will have been converted to pine, mainly by clearcutting and planting, by the year 2000. The consequences of site disturbance due to forest activities are discussed in terms of alteration in microclimate, water regime, hydrologic response, soil properties, soil movement, and sediment production. Also discussed are the relation to residual vegetation structure and implications for management. (Forest Service)
W79-02431

BROOK: A HYDROLOGIC SIMULATION MODEL FOR EASTERN FORESTS,
Forest Service (USDA), Durham, NH.
C. A. Federer, and D. Lash.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 311, Price codes: A05 in paper copy, A01 in microfiche. Water Resource Research Center, University of New Hampshire, Durham. Research Report No 19, 1978. 84 p, 17 fig, 6 tab, 64 ref. OWRT A-999-NH(5).

Descriptors: *Model studies, *Water budgets, *Watersheds(Basins), *Forests, *Water yield, Hydrology, Evapotranspiration, Transpiration, Streamflow, Temperature, Evaporation, Forest watersheds, *Forest management, *Simulation analysis, New Hampshire, Hubbard Brook(NH), North Carolina, Coweeta Watershed(NC), Harvesting, Nutrient concentration modeling, Soil evaporation, Nutrient studies, Simulation model, Eastern forests.

A hydrlogic model called BROOK simulates water budgets for forest land in the eastern United States. BROOK is a water-yield model for small areas; it was not designed to simulate flood peaks or watersheds with multiple aspects. It operates with a daily time interval, and requires daily precipitation and daily mean temperature as input variables. BROOK can simulate hardwood, conifer, mixed, cleared, and regrowing vegetation types, but these types must be uniform over the watershed. Partial cuts cannot be simulated. Evaportranspiration is divided into five components and streamflow into three components. The model was calibrated and verified using experimental watersheds at the Hubbard Brook Experimental Forest in New Hampshire and the Coweeta Hydrologic Laboratory in North Carolina. BROOK was designed to study the response of streamflow on different slopes and aspects to cover changes caused by harvesting and regrowth or by conversion from hardwoods to conifers. It has also been used to examine streamflow resonse to different hardwood transpiration characteristics, to estimate soil-water deficits prior to floods, to stimate soil water available for tree growth, as a base for nutrient concentration modeling, and as a teaching tool.
W79-02448

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

A SURVEY OF PHOSPHORUS AND NITROGEN LEVELS IN TREATED MUNICIPAL WASTEWATER,
Corvallis Environmental Research Lab., OR.
J. H. Gakstatter, M. O. Allum, S. E. Dominguez, and M. R. Crouse.
Journal of the Water Pollution Control Federation, Vol. 50, No. 4, p 718-722, April 1978. 2 tab, 10 ref.

Descriptors: *National Eutrophication Survey, *Phosphorus, *Nitrogen, *Waste water treatment, *Municipal wastes, *Eutrophication, Sewage treatment, Sewage disposal, Effluents, Nutrients, Limiting factors, Phsophates, Regulation, Effluent limitations, United States, Activated sludge, Sewage lagoons, Waste water disposal.

During EPA's National Eutrophication Survey (begun in 1972), effluent samples from 809 municipal wastewater treatment plants in 47 states were analyzed for nitrite, nitrate, ammonia, dissolved orthophosphorus, total Kjeldahl nitrogen, total phosphorus, and total nitrogen. Median per-capita total phosphorus load from conventional waste treatment plants is 1.0 kg/yr, 74% immediately available for algal uptake, while mean total phosphorus export from agricultural land is about 30.8 kg/sq km/yr, of which only 43% is immediately available. Treated municipal wastewater from a city of 10,000 people could have the same impact as runoff from 560 sq km of agricultural land. Because they are controllable, point sources should be emphasized where excessive nutrients are a problem. Banning detergent phosphates can reduce municipal effluent phosphorus loads by about 50%, but there are few water bodies for which a detergent phosphate ban alone would provide adequate protection. Conventional treatment phosphate result in effluents with only 2-4 times as much nitrogen as phosphorus (optimum algal needs are 11-15:1), and receiving waters are often nitrogen limited; phosphorus is usually limiting in unimpacted waters. Typical median total phosphorus discharges from wastewater treatment plants are 6.1 mg/liter, and median total nitrogen discharges are 15 mg/liter (2.5 kg/capita/yr.). Median concentrations of both nutrients are significantly lower in activated sludge and stabilization pond effluents than in primary or trickling filter effluent. (Lynch-Wisconsin)
W79-02003

EFFECTS OF FOREST WORKINGS ON STREAMFLOW AND WATER QUALITY (PART I),
Forestry and Forest Products Research Inst., Tokyo (Japan). Div. of Forest Influences.
For primary bibliographic entry see Field 5C.
W79-02005

ATMOSPHERIC FORMATION, DISPERSION, AND DEPOSITION OF ACID SUBSTANCES,
Swedish Water and Air Pollution Research Lab., Goteborg.
C. Brosset.
Report B-444, June 1978. 14 p, 1 tab.

Descriptors: *Acids, *Atmosphere, *Air pollution effects, *Fallout, *Airborne transport, *Path of pollutants, Fossil fuels, Acidic water, Water pollution sources, Soil contamination, Dry fallout, Precipitation(Atmospheric), *Sweden, Sulfuric acid, Nitric acid, Sulfur, Nitrogen, Chemical reactions.

Important physical-chemical processes in the formation, transport, and deposition of atmospheric acid substances are described, primarily from data of Swedish stations. Quantification of deposition is not included. Acid substances are products which may form or contain acids, i.e., proton-donating chemical individuals. Most airborne sulfuric acid, HSO4 (-), and nitric acid is caused by fossil fuel combustion. In all combustion, nitrogen and oxygen in the air react in the high temperature zone, forming nitric oxide, and if the fuel is sulfurous, sulfur dioxide and trioxide are also formed. Sulfur trioxide is immediately converted under the influence of water and ammonia to slightly acid ammonium sulfate. Through photochemical reactions, nitric acid may be formed from nitric oxide and sulfuric acid from sulfur dioxide; catalytic processes may also be important in sulfuric acid formation. Acid substances formed may be introduced directly or indirectly to the recipient soil or lake as strong acids (sulfuric and nitric) or weak acids (HSO4(-) and ammonium); ammonium results from participation of ammonia in the atmospheric processes. Potential acidifying effect is associated with the concentration sum c sub H(+) + c sub HSO4(-). Most acidification is caused by (1) dry deposition of sulfur dioxide (and probably nitric acid), and (2) wet deposition of c sub H(+) and c sub HSO4(-). (Lynch-Wisconsin)
W79-02015

APPLICATION OF A MODEL OF ZOOPLANKTON COMPOSITION TO PROBLEMS OF FISH INTRODUCTIONS TO THE GREAT LAKES,
State Univ. of New York at Albany Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-02020

NEW METHOD FOR RECORDING HEART AND RESPIRATORY RATES IN CATFISH,
Georgia Inst. of Tech., Atlanta. School of Biology.
For primary bibliographic entry see Field 7B.
W79-02077

MEASUREMENT OF CHELATING AGENT LEVELS IN MEDIA WITH HIGH CONCENTRATIONS OF INTERFERING METAL IONS,
Missouri Univ.-Columbia. Dept. of Chemistry.
D. R. Jones, IV, and S. E. Manahan.
Analytical Letters, Vol. 8, No. 7, p 421-434, 1975. 1 fig, 4 tab, 7 ref. OWRT B-095-MO(3), 14-31-0001-4099.

Descriptors: *Chelation, *Chelating agents, Chelex, Analysis, Atomic absorption, EDTA, Copper, Metal ions, Measurement, *Pollutant identification, Cation exchange, *Water analysis.

A method is described for the measurement of strong heavy metal chelating agents in water based upon the solubilization of copper from a chelating cation exchanger followed by atomic absorption analysis of the solubilized copper. The copper concentration is thus equivalent to the concentration of chelating agent. A banded column is employed consisting of alternate layers of sodium-form Chelex and copper-form Chelex and copper form Chelex ion exchanger. The former serves to remove interfering ions which would displace copper whereas the copper-Chelex bands provide a sources of copper which is approximately 1 mg/l copper divalent chelating capacity, and equivalent ions can be tolerated in the sample up to approximately 1x10-2 M. Samples ranging in pH from 4 to 9 can be analyzed using this method.
W79-02079

ATOMIC ABSORPTION DETECTOR FOR CHROMIUM ORGANOMETALLIC COMPOUNDS SEPARATED BY HIGH SPEED LIQUID CHROMATOGRAPHY,
Missouri Univ.-Columbia. Dept. of Chemistry.
D. R. Jones, IV, and S. E. Manahan.
Analytical Letters, Vol 8, No 8, p 569-574, 1975, 5 ref. OWRT B-095-MO(4), 14-31-0001-4099.

Descriptors: *Organometallics, *Chromium compounds, *Atomic absorption, *Chromatography, *Pollutant identification, Organic compounds, Liquid chromatography, *Water analysis, Heavy metals.

Organometallic compounds are significant pollutants, therefore methods are needed for the analysis of specific compounds rather than total metal. This paper describes the use of high speed liquid chromatography (HSLC) interfaced with atomic absorption (AA) for the analysis of organometallics. The compounds are separated by HSLC and compounds of a specific metal measured by an AA instrument interfaced directly to the end of the HSLC column. Only compounds of the sought-for metal are observed, thus eliminating interferences and allowing for the use of relatively lower grade solvent for the mobile phase. Chromium acetylacetonate, tris (2' hydroxyacetophenono)chromium, and chromium hexafluoroacetylacetonate were separated using a mobile phase of 0.5% pyridine in toluene (v/v) and a Waters Associates Porasil A column. Three well defined peaks were obtained in less than 5 minutes at a flow rate of 2.5 ml/min. A detection limit of 40 nanograms in a 10 microliter sample was estimated. The basic approach should be applicable to the analysis of organometallic compounds in sediments and tissue.
W79-02080

LIMNOLOGY OF SELECTED LAKES IN OHIO - 1975,
Geological Survey, Columbus, OH., Water Resources Div.
For primary bibliographic entry see Field 2H.
W79-02126

GEOLOGY AND GROUNDWATER RESOURCES OF NORTHERN BERKS COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02132

CHEMICAL QUALITY OF GROUND WATER IN FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Fairfax, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02133

MAJOR AQUIFERS IN CLARK COUNTY, SOUTH DAKOTA,
Geological Survey, Huron, SD. Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02134

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 1. WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02138

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02139

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1977.
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02140

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1977.
Geological Survey, Doraville, GA., Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-02141

VOLATILITY OF MERCURY FROM SOILS AMENDED WITH VARIOUS MERCURY COMPOUNDS,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
For primary bibliographic entry see Field 5B.
W79-02142

INVESTIGATION OF MATRIX INTERFERENCES FOR AAS TRACE METAL ANALYSES OF SEDIMENTS,
Gulf South Research Inst., New Orleans, LA.
M. M. McKown, C. R. Tschrin, and P. P. F. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 859, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/7-78-085, May 1978. 137 p, 62 fig, 46 tab, 21 ref. R 804317-01.

Descriptors: *Spectrophotometry, *Soil analysis, *Trace elements, *Sedimentology, Flame photometry, Soil chemical properties, Soil analysis, Absorption, Costs, Acid mine water, Fallout, Powerplants, Mine drainage, Analytical techniques, Atomic absorption, Cobalt, Copper, Lead, Manganese, Nickel, Zinc, Barium, Calcium, Strontium, Vanadium.

Research was conducted to develop reliable, cost-effective methods utilizing flame atomic absorption spectrophotometry (AAS) for the trace elemental analysis of soil and sediment samples containing complex matrices. Samples of bottom sediment affected by acid mine drainage, and soil samples exposed to fallout from a coal-fired power plant were studied. The soil sample matrix consisted of more than 0.1% aluminum and iron; the sediment sample matrix contained more than 0.1% aluminum and iron, plus small quantities of calcium, magnesium, manganese, phosphate, and potassium. Conventional flame AAS produced accurate results for the analyses of cobalt, copper, lead, manganese, nickel and zinc in these matrices. Accurate determination of barium, calcium, strontium, and vanadium could not be made by the conventional AAS techniques. However, reliable results for these metals were obtained utilizing appropriate flame types with the addition of lanthanum and/or an easily ionizable alkali salt to all samples and standards. It is concluded that the procedures used in this research should be applicable to all environmental samples containing similar matrices, and that the adaptation of the AAS techniques to samples other than those examined is possible. (Davison-IPA)
W79-02143

ANION EXCHANGE METHOD FOR THE DETERMINATION OF PLUTONIUM IN WATER: SINGLE-LABORATORY EVALUATION AND INTERLABORATORY COLLABORATIVE STUDY,
Monsanto Research Corp., Miamisburg, OH. Mound Facility.
C. T. Bishop, A. A. Glosby, R. Brown, and C. A. Phillips.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 435, Price codes: A05 in paper copy, A01 in microfiche. Report Nos. EPA-600/7-78-122 and MLM-2425, June 1978. EPA-IAG-D6-0015.

Descriptors: *Water analysis, *Laboratory tests, *Plutonium, *Pollutant identification, Analytical techniques, Testing procedures, Water sampling, Quality control, Anion exchange, Evaluation, Hydrologic properties.

Results of a single-laboratory evaluation and an intelaboratory collaborative study of a method for detemining plutonium in water are presented. The method, written for analysis of one liter samples, consists of a coprecipitation, acid dissolution, anion exchange, electrodeposition and alpha pulse height analysis. After single-laboratory evaluation of the selected method, duplicates of four different samples were sent to laboratories participating in the collaborative study. The first two samples were river water, the third a substitute ocean water sample, and the fourth, a river sediment with deionized, distilled water added. All samples contained known concentrations of plutonium-239 and plutonium-238 with concentrations ranging from 0.42 to 28.9 dis/min/liter. Combined within-laboratory standard deviation of the results averaged 5.7%. Average plutonium recovery was 69%. (Davison-IPA)
W79-02145

MACROINVERTEBRATE SAMPLING TECHNIQUES FOR STREAMS IN SEMI-ARID REGIONS: COMPARISON OF THE SURBER METHOD AND A UNIT-EFFORT TRAVELING KICK METHOD,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
C. E. Hornig, and J. E. Pollard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 643, Price code: A03 in paper copy, A01 in microfiche. Final Report No. EPA-600/4-78-040, July 1978. 28 p, 2 fig, 6 tab, 19 ref.

Descriptors: *Aquatic life, *Bioindicators, *Sampling, *Testing procedures, Macroinvertebrates, Benthic fauna, Stream, Net samplers, White River, Utah, Water analysis, Benthos, Bottom sampling, Arid climates, Semiarid climates.

Intensive macroinvertebrate sampling from a fauna-poor riffle on the White River, Utah, was conducted using two standardized techniques: a unit-effort traveling kick method, and a square foot Surber stream-bottom sampling method. The Surber method was of limited utility in the streams of the arid and semiarid regions of the Western U.S., due to the combined effects of faunal paucity and patchiness. Comparisons of 50 kick samples with 40 Surber samples revealed that kick samples provided more highly reproducible data than Surber samples in terms of counts of individuals and taxa, percentages of composition, and diversity indices. The reliability of the Surber sampler data was improved when visually richer sites were preselected. Differences in organism selectivity noted were that the Surber method attributed greater relative importance to the more closely adherent and cryptic forms, such as the simuliids, and the kick method was relatively biased toward easily dislodged oranisms such as baetid mayflies. It is recommended that the unit-effort traveling kick method be intensively tested for routine biological monitoring in larger fauna-poor western streams. (Davison-IPA)
W79-02146

RESEARCH ON CONTROL TECHNOLOGY FOR ICE FOG FROM MOBILE SOURCES,
Environmental Protection Agency, College, AK. Alaska Water Lab.
For primary bibliographic entry see Field 5G.
W79-02147

MASS BALANCE DETERMINATIONS FOR POLLUTANTS IN URBAN REGIONS. METHODOLOGY WITH APPLICATIONS TO LEAD, ZINC, CADMIUM, AND ARSENIC.
California Inst. of Tech., Pasadena, CA. Dept. of Environmental Health Engineering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 241, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/4-78-046, August 1978. 124 p, 17 fig, 17 tab, 129 ref. 68-03-4034.

Descriptors: *Pollutant identification, *Water pollution sources, *Path of pollutants, *Mass, Lead, Zinc, Cadmium, Chemical analysis, Analytical techniques, Distribution patterns, Movement, Industrial wastes, Arsenic compounds, Trace elements, Particle size, Systems analysis.

The methodology developed for constructing mass balances for pollutants, which are interlinked in their movement through the air, land and water of an urban industrial area is reviewed. Results are reported for lead, zinc, cadmium, and arsenic, and the data is published in the open literature. The analysis is based on the principle of the conservation of mass for a given chemical element. Flow diagrams for each chemical element balance are used, which trace the movement of the pollutants through the immediate environment, and into adjoining areas. New data on the physical mechanisms of trace metal deposition has been acquired, and the method of predicting the far deposition of lead, zinc, and cadmium is described. (Davison-IPA)
W79-02148

PROCEDURE FOR THE EVALUATION OF ENVIRONMENTAL MONITORING LABORATORIES,
Tracer Jitco, Inc., Rockville, MD.
C. Bicking, S. Olin, and P. King.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 718, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-600/4-78-017, March 1978. 224 p, 3 tab, 60 ref, 1 append. 68-03-2171.

Descriptors: *Laboratories, *Evaluation, *On-site investigations, Performance, Quality control, Laboratory equipment, Scientific personnel, Assessments, Inspection.

Procedures developed for use in evaluating laboratories engaged in measuring environmental pollution in the media of air, water, radiation and pesticides are presented. Laboratories are required to provide information on physical plant, equipment, personnel, quality control, and other aspects of laboratory performance on check list forms provided. On site inspection provides information on the less quantifiable laboratory aspects, and involves evaluation oriented to the specific methodology for which the laboratory is to be qualified. The scoring system is designed to be compatible with programs of proficiency testing, and is part of the total quality assurance program to objectively determine laboratory capability. This procedure is applicable to evaluation of laboratories of all sizes. (Davison-IPA)
W79-02149

EFFECT OF ANTIMYCIN ON STREAM INSECTS IN FIELD AND LABORATORY TRIALS,
Wisconsin Univ.-Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W79-02156

REDOX POTENTIAL MEASUREMENTS AS AN INDICATION OF BIOCHEMICAL WELL PLUGGING,
Ground Water Associates, Inc., Arlington, MA.
W. B. Armstrong.
Ground Water, Vol. 16, No. 6, p 446-447, November-December, 1977. 2 fig, 1 ref.

Descriptors: *Clogging, *Chemical precipitation, *Iron bacteria, Water wells, Well efficiency, Well rehabilitation, *Oxidation-reduction potential.

The Vyredox Method removes iron and manganese from ground water by injection of oxygenated water into the ground around a supply well. This stimulates the activity of certain beneficial bacteria which precipitate iron and manganese. The precipitates are held in the aquifer with a resulting improvement in water quality and improved long-term well efficiency. Hydrogeologic and geochemical investigations were made at an existing municipal supply well in the town of Pembroke, Massachusetts, to determine the feasibility of using the Vyredox Method. The existence of an active iron and manganese precipitating bacteria colony in the productive zone of the aquifer was confirmed as responsible for rapid plugging of the well. (Purdin-NWWA)
W79-02170

TRACE ELEMENT OF THE SARDIS RESERVOIR, MISSISSIPPI, AS RELATED TO CLAY MINERAL DISPERSION.

Mississippi Univ., University. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 2H.
W79-02187

INSTRUMENTS FOR MONITORING THE QUALITY OF NATURAL AND WASTE WATERS,
A. S. Yakunin, A. A. Kuz'min, and V. B. Belyakov.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 73-76, 1977. 5 fig. Translated from Hydraulic Engineering and Reclamation (Gidrotekhnika i melioratsiya), No. 1, p 111-115, 1977.

Descriptors: *Water quality, *Monitoring, *Instrumentation, Measurement, Dissolved oxygen, Biochemical oxygen demand, Water temperature, Foreign research, Waste water(Pollution), Natural streams, Polarographic analysis, Analytical techniques, Methodology, Chemical analysis, *USSR.

Instruments were described for automatically measuring dissolved oxygen, BOD, and oxygen consumption by waste waters. Block diagrams of equipment components and electronic circuits were given. After automatic measurement of dissolved oxygen by the polarographic method, the tested water sample can be used for further analysis. The portable analyzers for measuring the content of dissolved oxygen and its consumption rate and the equipment for the automatic determination of the BOD meet operating requirements in the laboratory and field and are relatively simple, compact, and easy to operate. The analyzers and their equipment can be used in scientific and industrial laboratories for the analysis of any liquid media. (Humphreys-ISWS)
W79-02214

USE OF FLUORESCENCE MICROSCOPY FOR QUANTIFYING PHYTOPLANKTON, ESPECIALLY FILAMENTOUS BLUE-GREEN ALGAE,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W79-02239

POLYCHLORINATED BIPHENYLS IN COASTAL MARINE ZOOPLANKTON: BIOACCUMULATION BY EQUILIBRIUM PARTITIONING,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W79-02242

AN EVALUATION OF ISOTOPE CONCENTRATIONS IN THE GROUND WATER OF SAUDI ARABIA,
Geological Survey, Riyadh (Saudi Arabia). Water Resources Div.
For primary bibliographic entry see Field 2F.
W79-02254

DEVICE FOR MEASURING PH AND TEMPERATURE OF A LIQUID, WHICH INCLUDES A MEMORY,
Dow Chemical Co., Midland, MI. (Assignee).
J. V. Goode, Jr.
U.S. Patent No. 4,109,527, 8 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2079, August 29, 1978.

Descriptors: *Patents, *Water pollution control, Monitoring, Instrumentation, Thermal pollution, Water temperature, Hydrogen ion concentration, Electronic equipment, Data processing, Data transmission.

Disclosed is a portable electronic probe device, including a memory system, which is useful for measuring the pH and temperature of waste streams from chemical processes, to avoid thermal pollution and undesirable algae growth in rivers or ponds into which the waste is discharged. The pH sensor consists of a glass electrode-reference electrode combination. The temperature sensor is made up of a thermistor fitted into a well enclosure at the bottom of the probe. A display box attached to the probe contains a memory system. The pH and temperature value is received by the memory system as an electrical signal. The signals are amplified, converted from analog to digital data, and stored in a digital memory. The pH and temperature data, and the precise location at which the measurement is taken, appear continuously as digital displays in a transparent panel on the display box. When the memory is full the probe device is placed in a charger stand to re-charge a battery in the memory system by a magnetic 'coupling' sequence. At the same time, the data in the memory is clocked into a computer-recorder associated with the charger stand, using an optical 'blocking' technique. In this device the memory system can record and store pH and temperature data from up to 192 locations before it becomes full. (Sinha-OEIS)
W79-02316

CHEMICAL CHARACTERIZATION OF LOCAL AND STRATOSPHERIC PLUTONIUM IN OHIO SOILS,
Argonne National Lab., IL. Radiological and Environmental Research Div.
R. N. Muller.
Soil Science, Vol. 125, No. 3, p 131-136, March, 1978. 1 fig, 5 tab, 21 ref, 1 append.

Descriptors: *Isotope studies, Chemical analysis, Ecosystems, Industrial wastes, Soil contamination, *Ohio, *Plutonium, *Air pollution effects, Path of pollutants.

The chemical nature of plutonium derived from stratospheric fallout and industrial sources was studied in three agricultural soils. The majority of the soil plutonium was associated with a reductant-soluble, hydrous oxide phase that, under most conditions of terrestrial ecosystems, remains essentially immobile. The proportion of plutonium associated with organic matter (0.IN NaOH-extractable) varied among soils, and increased with decreasing particle size in the same soil. In a soil containing 238Pu from a local fabrication facility and 239,240Pu from stratospheric fallout, isotopic ratios between the NaOH-extractable and residual phases were essentially constant, indicating that, in these soils, plutonium from both sources behaves similarly. The distribution of soil plutonium with particle size appears to be most directly related to the mass of the soil particle. (Skogerboe-Colorado State)
W79-02320

SCANNING APPARATUS FOR SEPTIC EFFLUENTS,
Environmental Devices Corp., Marion, MA. (Assignee).
For primary bibliographic entry see Field 5D.
W79-02340

CONSIDERATIONS IN CONDUCTING BIOASSAYS,
WAPORA, Inc., Charleston, IL. Bioassay Lab.
D. R. Rosenberger.
U.S. Army Engineer Waterways Experiment Station, Technical Report D-78-23, June 1978. 144 p, 7 tab, 842 ref.

Descriptors: *Bioassay, Freshwater fish, *Toxicity, *Pollutant identification, Water pollution effects, *Literature reviews, *Bibliographies.

A discussion of the bioassay principles and techniques in the literature are presented to provide a background for an understanding of aquatic bioassay testing. Aquatic bioassays often encounter complex toxicity problems. Two or more toxic compounds may be acting together or the toxicant concentration may fluctuate. Techniques in aquatic testing may vary depending on the type of toxicant tested and environmental parameters, such as temperature or dissolved oxygen, that need be controlled. Toxicant dosing equipment varies with the type of test species, source of water, and type of toxicant in question. The two most widely used delivery systems are the serial diluter and proportional diluter. Selection of bioassay test species warrants careful consideration. The criteria for selection of species cited by most authors include: type of test; economic importance; ecological significance; geographical distribution; ease of capturing, handling, holding, and culturing; availability and local abundance; toxicity responsiveness; consistency of response to toxicity; and reproductive success under assay conditions. The vast majority of species discussed in the bioassay literature are freshwater fish, primarily bluegill, rainbow trout, fathead minnow, goldfish, and largemouth bass. Recommended methods for capturing, handling, and maintaining many plants and animals for use in bioassays are presented. (WES)
W79-02349

ANALYSES OF PAPER MACHINE WATERS WITH ION SPECIFIC ELECTRODES. PART V. SULFIDE DETERMINATION USING AG(+) ION SPECIFIC ELECTRODE AND VARIOUS MEASUREMENT METHODS,
Valmet Oy, Jyvaskyla (Finland).
J. Korhonen, and P. O. Lumme.
Paperi ja Puu, Vol. 60, No. 5, p 373-379, May, 1978. 6 fig, 14 ref, 5 tab.

Descriptors: *Water analysis, *Sulfides, *Pulp wastes, Electrodes, Silver, Ions, Analytical techniques, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Microorganisms, Hydrogen sulfide, Volumetric analysis, Waste water(Pollution), Spectrophotometry, Storage, Waste storage, Calibrations, White water(Paper machines).

Water and white water circuits of two paper machines known to contain microorganisms that produced hydrogen sulfide were samples, and the samples were stored in air-free bottles and analyzed at weekly intervals, using different calibration and titration methods in conjunction with a silver electrode. Those calibration methods involving samples and calibration solutions prepared with NaOH solution containing ascorbic acid gave the best results across the entire concentration range. Titrations produced satisfactory results at high concentration. The spectrophotometric standard method was fairly accurate at low concentrations, but its negative error increased with increasing sulfide concentration. Compared to the calibration method, spectrophotometry was very laborious and gave low values at high sulfide concentrations. Iodometry was suitable mainly for analysis of highly concentrated sulfide solutions. (See also W78-09523; W74-11094; and W74-11093) (Brown-IPC)
W79-02388

EVALUATION OF SEMIPERMEABLE MEMBRANES FOR CONCENTRATION OR ORGANIC CONTAMINANTS IN DRINKING WATER,
Gulf South Research Inst., New Orleans, LA.
I. Cabasso, C. S. Eyer, E. Klein, and J. K. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 245, Price codes: A09 in paper copy, A01 in microfiche. Final Report No EPA-670/1-75-001, June 1975. 192 p, 35 fig, 16 tab, 43 ref, 3 append. 68-03-0126.

Descriptors: *Pollutant identification, *Semipermeable membranes, *Water analysis, *Analytical techniques, *Osmotic pressure, *Reverse osmosis, *Osmosis, Separation techniques, Evaluation, Solutes, Water pollution, Water quality, Potable water, Trace elements, Membrane processes.

A study was conducted to develop an analytically sound concentration method based on membrane separation techniques, for concentrating and recovering trace organic chemicals in potable water. The five membrane materials evaluated through experiment and through a review of the literature included cellulose acetate, cellulose acetate butyrate, ethyl cellulose, polyamide, and polyurea (NS-1). Osmotic concentration (OC) and reverse osmosis (RO) were the two methods used to evaluate the membrane materials. A complete description of

the OC apparatus is provided; RO data are taken from the literature, and description of an RO concentration scheme is included. Results of the study, combined with data from the literature, show: the feasibility of concentration and recovery of organic solutes by osmotic techniques, and that: (1) the degree of recovery of organic solutes varies with the particular solute-membrane combination; (2) a membrane's salt rejection is a good indicator of its mechanical integrity, but not its potential for concentrating organics; (3) solute recovery is influenced by the applied osmotic or hydraulic pressure; (4) the cellulose acetate-derived membranes serve as satisfactory first-separation membranes; (5) polyurea and polyamide are best suited for final concentration; (6) rejection expected from OC runs were higher for short concentration runs than RO; (7) RO processes handled large volumes of water easier than the OC process; and (8) very high osmotic pressure could be applied in OC procedures without altering membrane properties. (Davison-IPA)
W79-02405

QUANTITATIVE MAPPING BY REMOTE SENSING OF AN OCEAN ACID-WASTE DUMP,
National Aeronautics and Space Administration, Hampton, VA. Langley Research Center.
C. W. Ohlhorst.
Available from the National Technical Information Service, Springfield, VA 22161 as N78-33617 Price Codes : A03 in paper copy, A01 in microfiche. NASA Technical Paper 1275, October 1978. 26 p, 7 fig, 5 tab, 9 ref, 1 append.

Descriptors: *Waste identification, *Remote sensing, *Mapping, *Oceans, Analytical techniques, Acid wastes, Physical properties, Spectroscopy, Iron, Waste disposal, Industrial wastes, Organic wastes, Solid wastes, Sea water, Water pollution, Suspended solids, Waste dumps, On-site investigations, Inorganic compounds, Ocean dumping.

A remote sensing experiment was conducted at an ocean acid-waste dump site off the coast of Delaware to assess the possibility of relating remotely sensed spectral signatures to acid-waste concentrations. In situ water samples and measurements and concurrent remotely sensed data were obtained at the site. Results of the analysis for quantifying and mapping the acid-waste plume in terms of its particulate iron concentration and its suspended solids concentrations are presented. Total suspended solids, organic suspended solids, and inorganic suspended solids could not be accurately quantified and mapped with this data set. A linear least-squares-fit equation using the ratio of band 2 (440 to 490 nm) radiance to band 4 (540 to 580 nm) radiance was used to calculate iron concentration. The range of particulate iron concentrations in the plume ranged up to 1.1 mg/l at a depth of 0.46 m. A classification technique was developed to identify Sun-glitter affected pixels in the background-water data. (Davison-IPA)
W79-02407

COMPARISON OF METHODS FOR THE DETERMINATION OF TOTAL AVAILABLE RESIDUAL CHLORINE IN VARIOUS SAMPLE MATRICES,
Environmental Monitoring and Support Lab., Cincinnati, OH.
D. F. Bender.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 572, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/4-78-019, April 1978. 38 p, 1 fig, 15 tab, 15 ref.

Descriptors: *Pollutant identification, *Water analysis, *Chlorine, *Laboratory tests, Calcium compounds, Water treatment, Waste water, Effluents, Sewage, Potable water, Iodide reagents, River water, Distilled water, Chlorination, Oxidation, Testing procedures, Quality control, Water sampling.

Ten total available residual chlorine procedures were investigated to determine which procedure is most appropriate for particular sample matrices. All of the methods involve the same basic reaction: the oxidation of iodide reagents to iodine in a solution buffered at pH4. Data is provided concerning the precision, accuracy, and range, as well as the general advantages, and problems likely to be encountered in applying the methods to actual samples. Samples selected for study included distilled water, tap water, river water, a sewage plant effluent, and raw sewage; only the tap water did not require the addition of chlorine. Each of the methods worked well with certain matrices, but not in others, indicating the importance of the nature of the sample matrix. The data are tabulated, and a schematic representation shows the relative accuracy of the methods. (Davison-IPA)
W79-02412

PARTIAL CHARACTERIZATION OF CHLORINATED ORGANICS IN SUPERCHLORINATED SEPTAGES AND MIXED SLUDGES,
Municipal Environmental Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5D.
W79-02413

INVESTIGATION OF THE MICROFLORA OF SWAMP ORE AND LAKE WATER BY THE METHOD OF ELECTRON MICROSCOPY, (IN GERMAN),
V. G. Dubinina, and Z. Derjugina.
Archiv Hydrogiologie, Vol. 71(1), p 90-102. November, 1977. 22 fig, 1 tab, 20 ref.

Descriptors: *Swamps, *Electron microscopy, *Iron bacteria, Wetlands, Bacteria, Microorganisms, Microscopy, Lakes, *Pollutant identification.

Electron and optical microscopy were used to investigate samples of swamp ore from two types of swamps and lacustrine freshwater. By means of electron microscopy a large number of small forms of iron bacteria and a number of interesting forms of microorganisms were revealed and some morphological details were clarified. In acidic swamps of pH 2.8-3.5, iron hydroxides have amorphous structure and the microflora was monotous. The microflora of samples of water and ores studied appeared to be more diversified and rich than had been previously assumed. (Steiner-mass)
W79-02423

A STATISTICAL EVALUATION OF SOME COLUMBIA RIVER BASALT CHEMICAL ANALYSIS,
Atomics International Div., Richland, WA. Rockwell Hanford Operations.
F. Asare, H. V. Michel, and C. W. Myers.
Available from the National Technical Information Service, Springfield, VA 22161 as RHO-BWI-ST-3, Price codes: A02 in paper copy, A01 in microfiche. Report No RHO-BWI-ST-3, May 1978. 62 p, 13 fig, 7 tab, 7 ref. EY-77-C-06-1030.

Descriptors: *Chemical analysis, *Analytical techniques, *Atomic absorption, *Statistical methods, *Radioactive waste disposal, *Basalts, *Columbia River Basin, Correlation analysis, Geological units, Geologic formations, Stratigraphy, Geologic investigations, Soil chemistry, Neutron activation analysis.

A statistical evaluation of the chemical data of the basalt layers of the Columbia River Basalt Group to determine their usefulness for identifying and correlating basalt units is presented. Examination of the atomic absorption data indicates that the oxides were measured with precision better than 4%; neutron activation analysis was measured with a precision better than 6%. The most important elements for basalt characterization can be ranked in descending order: (1) chromium and iron; (2) scandium, europium, potassium, magnesium, and titanium; and (3) barium, calcium, cobalt, aluminum, and sodium. Samples from Core Holes DDH-1, DH-2, DDH-3, DH-4, and DH-5 were compared with the type locality reference groups to determine if correlations could be established statistically using the data. Overall, 90% of the basalt core samples in DDH-3, DH-4, and DH-5 down to the level of the Priest Rapids IV could be statistically correlated; the correlations were unambiguous for many. Below the Priest Rapids IV level, statistical correlations of the basalts were more ambiguous due to the greater chemical similarity of these basalts. (Davison-IPA)
W79-02433

ASBESTOS IN THE WATER SUPPLIES OF THE TEN REGIONAL CITIES, PART I,
McCrone Research Inst., Chicago, IL.
I. M. Stewart.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 620, Price codes: A04 in paper copy, A01 in microfiche. Final Report No EPA-560/6-76-017, April 1976. 58 p, 1 fig, 14 tab, 12 append. 68-01-2690.

Descriptors: *Pollutant identification, *Asbestos, *Water sampling, *Water pollution, Water analysis, Cities, Water supply, Surveys, Electron microscopy, Boston, New York City, Philadelphia, Atlanta, Chicago, Dallas, Kansas City, Denver, San Francisco, Seattle.

A nationwide survey was conducted to determine the impact of point and non-point sources on waterborne sources of asbestos. Both natural sites, in which asbestos bearing rocks are prevalent, and man-made sources were covered by the survey. As part of this program, an analysis was made of raw and finished water from the ten major cities housing regional headquarters of the Environmental Protection Agency: Boston, New York, Philadelphia, Atlanta, Chicago, Dallas, Kansas City, Denver, San Francisco, and Seattle. Results show essentially no asbestos fibers in New York, Chicago, Dallas, Kansas City and Denver. Asbestiform fibers were detected in Boston, Philadelphia, Atlanta and Seattle and the potential exists for asbestos contamination in the water supply of San Francisco. Asbestos content was determined by a transmission electron microscopic method. Samples of the water vacuum filtered through 47 mm diameter, 0.45 micrometer pore-size membrane filters that were then prepared for examination on the transmission electron microscope by a direct transfer method. (Gibson-IPA)
W79-02441

DETERMINATION OF METHYLMERCURY IN FISH OF SOUTH CAROLINA,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
A. K. Koli, and W. T. Canty.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 537-543, 1978. 3 fig, 1 tab, 6 ref.

Descriptors: *Mercury, *Brown trout, Food chains, Heavy metals, Path of pollutants, Water pollution effects, Gas chromatography, Analytical techniques, Chemical analysis, Fish physiology, Animal metabolism, Methodology, *South Carolina, Pollutant identification, Tissue analysis, *Bioaccumulation, *Methylmercury, Monomethyl-mercury, Dimethyl mercury.

Brown trout were analyzed for methylmercury using gas chromatography. Definite evidence that the fish contained monomethyl and dimethyl mercury was presented. Data on the specific laboratory techniques involved in extraction were included. The fate of mercury in the marine environment was also discussed. (EIS-Deal)
W79-02478

ETHYLMERCURY: FORMATION IN PLANT TISSUES AND RELATION TO METHYLMERCURY FORMATION,
Environmental Monitoring and Support Lab., Las Vegas, NV.
L. C. Fortmann, D. D. Gay, and K. O. Wirtz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 093, Price codes: A02 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-70-037, April 1978. 7 p, 2 tab, 2 fig, 8 ref.

Descriptors: *Mercury, *Metals, *Plant physiology, *Plant biochemistry, Air pollution, *Air pollution effects, Laboratory tests, Bioassay, Laboratory tests, Ethylmercury, Methylmercury, Trace elements, Elemental mercury vapor.

Seedlings of the common dwarf garden pea, Pisum sativum, cv. Little Marvel, exposed to elemental mercury vapor formed both methylmercury and ethylmercury in all parts of the plant. Concentrations of both organomercury compounds fluctuated considerably over a 48-hour exposure period, but the total of detectable forms of mercury continued to rise due to increased ethylmercury formation. Ethylmercury formation was greater in the light than in the dark, but methylmercury concentration did not differ significantly. The pattern of change in the concentrations of methtylmercury suggests both are metabolites of a single mercury pathway in peas. (EIS-Katz)
W79-02488

THE EFFECTS OF SOME BASIC STATISTICAL AND BIOLOGICAL PRINCIPLES ON WATER POLLUTION CONTROL,
British Columbia Univ., Vancouver. Faculty of Commerce and Business Administration.
For primary bibliographic entry see Field 5G.
W79-02498

5B. Sources Of Pollution

SIGNIFICANCE OF NITRIFICATION IN STREAM ANALYSIS-EFFECTS ON THE OXYGEN BALANCE,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5C.
W79-02001

A DYNAMIC LAKE MODEL FOR TROPHIC STATE PREDICTION,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserrinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5C.
W79-02006

EXAMINATION OF A LAKE MODEL,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5C.
W79-02007

A SIMULATION MODEL FOR PHYTOPLANKTON GROWTH AND NUTRIENT CYCLING IN EUTROPHIC, SHALLOW LAKES,
For primary bibliographic entry see Field 5C.
W79-02008

ATMOSPHERIC FORMATION, DISPERSION, AND DEPOSITION OF ACID SUBSTANCES,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5A.
W79-02015

KINETICS OF PHOSPHATE UPTAKE BY AQUATIC MICROORGANISMS: DEVIATIONS FROM A SIMPLE MICHAELIS-MENTEN EQUATION,
Wisconsin Univ.-Madison. Dept. of Soils.
For primary bibliographic entry see Field 5C.
W79-02016

A MATERIAL BALANCE STUDY OF POLYCHLORINATED BIPHENYLS IN LAKE MICHIGAN,
Dow Chemical Co., Midland, MI. Environmental Science Research Lab.
For primary bibliographic entry see Field 5C.
W79-02017

P-32 UPTAKE IN LENTIC ALGAE,
Georgia Inst. of Technology, Atlanta. School of Biology.
For primary bibliographic entry see Field 5C.
W79-02078

DISAPPEARANCE OF NITRATE UNDER TRANSIENT CONDITIONS IN COLUMNS OF SOIL,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W79-02122

ESTIMATES OF 7-DAY, 10-YEAR MINIMUM FLOWS AT SELECTED STREAM SITES IN PUERTO RICO,
Geological Survey, San Juan, PR. Water Resources Div.
E. D. Cobb.
Open-file report 78-583, August 1978. 47 p, 2 fig, 2 tab, 3 ref.

Descriptors: *Streamflow, *Low flow, *Low-flow frequency, *Waste assimilative capacity, *Puerto Rico, Streams, Analytical techniques, Data collections, Regression analysis.

The 7-day, 10-year minimum flow of streams is used as an index for determining the capacity of streams to receive waste effluents. This index of flow was computed from streamflow records for 31 stream sites in Puerto Rico. In addition, there was a need for the 7-day, 10-year minimum flow at an additional 15 stream sites for which adequate streamflow data were not available. The flow index was estimated at these sites on the basis of available record, records at nearby sites, and comparisons with drainage areas. (Woodard-USGS)
W79-02125

WATER QUALITY IN THE OLD PLANTATION WATER CONTROL DISTRICT, BROWARD COUNTY, FLORIDA-PROGRESS REPORT, JULY 1976-JUNE 1977,
Geological Survey, Tallahassee, FL., Water Resources Div.
G. M. Russell, C. E. Hanson, and W. A. J. Pitt, Jr.
Open-file report 78-411, 1978. 29 p, 4 fig, 11 tab, 8 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Florida, *Canals, Coliforms, Nutrients, Trace elements, Insecticides, Bottom sediments, Water analysis, Sampling, Sewage effluents, Storm runoff, Agricultural runoff, Broward County(VA), *Plantation Canal(VA).

Water quality in the Old Plantation Water Control District in Broward County, Florida has been affected by effluent from sewage-treatment plants, agriculture, and storm-water runoff. Effect of effluent from sewage-treatment plants on water quality was evident at 3 sites where concentrations of nutrients and bacteria in the Broward County canals exceeded State standards of 2,400 colonies per 100 milliliters for total coliform bacteria. At 2 of the 3 sites the fecal coliform/fecal streptococcus ratios indicated possible human contamination. The effect of agriculture on water quality was evident where relatively high levels of chlorinated hydrocarbon insecticides had concentrated in the bottom sediments, of the canals. For example, DDD reached levels of 330 micrograms per kilogram at one site. The effects of storm-water runoff on water quality were detected during the wet season when concentrations of several trace elements increased. For example, zinc averaged 30 micrograms per milliliter in the wet season compared with 20 micrograms per milliliter during the dry season. (Woodard-USGS)
W79-02127

VOLATILITY OF MERCURY FROM SOILS AMENDED WITH VARIOUS MERCURY COMPOUNDS,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
R. D. Rogers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 014, Price codes: A03 in paper copy, A01 in microfiche. Final Report No. EPA-600/3-78-046, April 1978. 16 p, 4 fig, 2 tab, 8 ref.

Descriptors: *Mercury compounds, *Mercury volatilization, *Soil investigations, *Mercury, Soil physical properties, Soil texture, Mercury, Volatility, Sands, Clay loam, Loam.

Five different mercury compounds were used with three types of soil in a study conducted to determine the rate of mercury volatilization from soils freshly amended with mercury. Each of the soils, sand, loam, and clay was amended with each of the water-soluble mercury compounds: mercuric nitrate, mercuric chloride, mercuric acetate, mercuric oxide, and mercuric sulfide. It was concluded that mercury was volatilized from all the soils, but this loss was dependent on the soil type, and the form of mercury used. The maximum loss occurred within one week of the amendment. Further work is needed to determine the mechanism causing the volatilization of mercury applied to soil. (Davison-IPA)
W79-02142

SOURCE ASSESSMENT: WATER POLLUTANTS FROM COAL STORAGE AREAS,
Monsanto Research Corp., Dayton, OH.
R. A. Wachter, and T. R. Blackwood.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 420, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/2-78-004m, May 1978. 121 p, 10 fig, 55 tab, 69 ref, 4 append. 68-02-1874.

Descriptors: *Coal mine wastes, *Water pollution, *Effluents, *Drainage effects, Water quality, Soil chemical properties, Runoff, Storm runoff, Simulated rainfall, Leaching, Precipitation(Atmospheric), Waste water(Pollution), Water sampling, Hydrologic aspects, Organic matter, Inorganic compounds, Coal stockpiles.

Effluents, due to leaching and drainage during and after precipitation are emitted from coal stockpiles maintained outdoors at production and usage sites. Aquatic life forms are exposed to these effluents as the runoff flows into waterways. The effluent levels from these sources are quantified through examination of coals, newly mined and aged, from six coal regions of the U.S. A representative source is defined to help characterize the waste water level from coal storage areas. Coals from the various areas were subjected to a rainfall simulator, and grab samles of the waste water were taken to obtain effluent data. The samples were analyzed for organic and inorganic matter and water quality parameters. Hydrologic relationships were used to estimate the runoff concentrations. Water quality criteria concentrations are compared with these levels to estimate their potential environmental impact. Applicable and future control techniques are discussed along with the growth and nature of stockpile quantities retained at production and usage sites. (Davison-IPA)
W79-02144

MASS BALANCE DETERMINATIONS FOR POLLUTANTS IN URBAN REGIONS. METHODOLOGY WITH APPLICATIONS TO LEAD, ZINC, CADMIUM, AND ARSENIC.
California Inst. of Tech., Pasadena, CA. Dept. of Environmental Health Engineering.
For primary bibliographic entry see Field 5A.
W79-02148

STORM DERIVED LOSSES OF PHOSPHORUS AND THEIR SIGNIFICANCE TO ANNUAL PHOSPHORUS EXPORT FROM TWO NEW JERSEY WATERSHEDS,
Rutgers - The State Univ., New Brunswick. Dept. of Zoology.
V. H. Smith.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 734, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, Oct 1976. 109 p, 28 fig, 8 tab, 34 ref. OWRT A-047-NJ(3), 14-34-0001-7064.

Descriptors: Streams, *Storm runoff, *Phosphates, Eutrophication, Reservoirs, Nutrients, *Phosphorus, *Nutrient removal, *New Jersey, Watersheds(Basins), Watershed management, *Path of pollutants, Dissolved solids, *Spruce Run Creeks(NJ), *Mulhockaway Creek(NJ), Water pollution sources, Self purification.

Transport of total phosphorus, total dissolved phosphorus, and soluble reactive phosphorus was measured under steady-state base flow and storm flow conditions in Spruce Run and Mulhockaway Creeks which drain adjoining watersheds and are the major water source for Spruce Run Reservoir, New Jersey. Day-to-day variability was greater in Spruce Run than Mulhockaway Creek as was the mean TP concentration. Apparently the SRP fraction was responsible for the difference. Estimated 240 day base flow loss of TP from Spruce Run Creek watershed was from .10 to .14 kg/ha and from Mulhockaway Creek it was .06 to .09 kg/ha. Approximate estimates of 365-day TP loading to the reservoir ranged from 0.17 to 0.24 g/m2/yr which exceeds the 'dangerous' level. Storm derived phosphorus export from both watersheds varied with storm intensity. Mild storms contributed only 1 to 2% over the base flow load whereas more intense storms could have contributed 50% or more of an annual TP load. Most of the storm derived TP was in particulate form which originated either from resuspended and scoured stream bed sediments or as soil particles in runoff.
W79-02151

THE EFFECTS OF STORM EVENTS ON THE ANNUAL PHOSPHORUS TRANSPORT IN SIX-MILE RUN,
Rutgers - The State Univ., New Brunswick. Dept. of Zoology.
B. A. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 722, Price codes: A09 in paper copy, A01 in microfiche. Master of Science Thesis, May 1978. 177 p, 56 fig, 6 tab. OWRT A-047-NJ(4), 14-34-0001-7064.

Descriptors: Streams, *Storm runoff, *Phosphates, Eutrophication, Reservoirs, Nutrients, Nutrient removal, *New Jersey, *Path of pollutants, *Phosphorus, *Six-Mile Run(NJ), Dissolved solids, Water pollution effects.

The importance of storm events for calculating phosphorus loading was studied. Concentrations appeared to be unrelated to flow during low flows but showed a weak relationship during high flows, and there was no consistent diurnal fluctuation of the concentration. Weekly samples could depict the concentrations present in the stream for the previous week if no storm intervened. Large changes in concentration occurred during storm flows above 1,000 l/s. Dissolved fractions usually increased during peak flow but did not if the major rainfall was a distance upstream from the sampling site. Winter storms or melts behave similarly to rainstorms in regard to phosphorus concentration changes. Due to the high flows and increased concentrations during storms, the storms contributed close to 50% of the yearly phosphorus loading for this stream. Importantly, the total phosphorus loading could be predicted for a storm once the stream's characteristics were known. This would reduce the time-consuming process of collecting storm events. Therefore it is possible to calculate the steady-state and storm phosphorus loading for a stream once a few storms and steady-state are collected.
W79-02153

INTERTIDAL ENVIRONMENT OF NORTHERN DUBLIN BAY,
Trinity Coll., Dublin (Ireland). Dept. of Botany.
D. W. Jeffrey, P. H. Pitkin, and A. B. West.
Estuarine and Coastal Marine Science, Vol. 7, No. 2, p 163-171, August 1978. 3 fig, 4 tab, 19 ref.

Descriptors: *Intertidal areas, *Pollutants, *Sediments, *Estuarine environment, Bays, Organic matter, Surveys, On-site investigations, Sampling, Cores, Metals, Phosphorus, Lead, Zinc, Copper, Chemical analysis, Analysis, Analytical techniques, Nitrogen, Sodium, Silts, Sands, Gravel, Correlation analysis, Foreign research, *Ireland.

A detailed survey of 10 km of the intertidal zone of Northern Dublin Bay was carried out by core sampling. One hundred samples were examined for variables, including particle size, organic matter, total nitrogen, phosphorus and lead, copper, and zinc. Results were presented in terms of: (1) correlations between pairs of variables; (2) location of sampling station; and (3) using multivariate analysis to achieve simple site classification. It was concluded that two distinct levels of environmental quality occur, with critical levels of organic matter, phosphorus, and zinc in the more polluted. A reasonable background level for organic matter for sandy mud would be 2.5% ignition loss or approximately 450 ppm total N. It was deduced from the low correlation coefficients that phosphorus may be either originating from a different source or is concentrated by a different process to organic matter. The decline in phosphorus concentration follows a more regular course, which is not markedly altered by changes in sedimentation. Background phosphorus concentration might sensibly be set at between 150 and 200 ppm P. The close correlation of the highest zinc and phosphorus values suggest either a common origin or a coprecipitation, or possibly both. Suggested background levels of zinc are in the order of 50 ppm. Although variation in copper was observed, strongly associated with both zinc and organic matter, concentrations as determined generally do not rise above a reasonable background of between 15-20 ppm. (Humphreys-ISWS)
W79-02204

COMPUTATION OF THE CONCENTRATION OF SUBSTANCES IN RIVERS AND CANALS,
Yu. A. Ibad-Zade, S. G. Gurbanov, and S. G. Azimov.

The concentration of polluting substances was computed for stationary waste water releases. It was assumed that it depends on x and y and that the turbulent diffusion coefficients differ in these directions and have constant values. A mathematical model presented for computing pollutant concentrations was verified from four series of experiments on the Kura River (USSR). During the field investigations, the following parameters were taken at five fixed gaging stations: (1) the velocity distribution on three verticals, (2) cross sectional areas, (3) slope of the water surface, (4) discharge, and (5) water samples for determination of the concentration of pollutants and background concentrations. Theoretical data generally agreed satisfactorily with the experimental data. (Humphreys-ISWS)
W79-02206

A SYSTEMATIC PROCEDURE FOR TAXING AGRICULTURAL POLLUTION SOURCES,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
For primary bibliographic entry see Field 5G.
W79-02219

SURFACE DRIFTER MOVEMENTS OBSERVED IN PORT ANGELES HARBOR AND VICINITY, APRIL 1978,
Evans-Hamilton, Inc., Seattle, WA.
For primary bibliographic entry see Field 2L.
W79-02221

SEASONAL FLUCTUATION OF WATER QUALITY (NUTRIENTS AND PIGMENTS) IN LOWER DELAWARE BAY,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 5C.
W79-02223

SIMULATION MODEL OF CRYPTOMONAS OVATA POPULATION DYNAMICS IN SOUTHERN KOOTENAY LAKE, BRITISH COLUMBIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5C.
W79-02225

THE DISTRIBUTION AND FORM OF PHOSPHORUS IN NORTH ATLANTIC OCEAN DEEP-SEA AND CONTINENTAL SLOPE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
J. W. Morse, and N. Cook.
Limnology and Oceanography, Vol. 23, No. 4, p 825-830, July 1978. 5 fig, 2 tab, 8 ref. NSF OCE 74-02352 A04.

Descriptors: *Sediments, *Phosphorus, *Deep water, *Continental slope, *Sediment-water interfaces, Apatite, Calcium carbonate, Diagenesis, Continental shelf, Oceans, Atlantic Ocean, Cape Hatteras(NC), North Carolina, Iron, Manganese, Carbon, Cycling nutrients, Distribution, Phosphates.

The general distribution of different forms of phosphorus in continental slope (Cape Hatteras, North Carolina) and deep-sea (central North Atlantic Ocean) sediments was investigated, as well as the extent to which this distribution is related to such other sediment compounds as organic carbon, calcium carbonate, and trace metals. Knoweldge of the chemistry of phosphorus diagenesis in these sediments is important in understanding the overall oceanic phosphorus cycle, since such sediments represent major oceanic phosphorus sinks. Core samples showed that apatite-phosphorus is the most important phosphatic component, and its abundance closely follows that of calcium carbonate in deep-se sediments. Nonapatite inorganic phosphorus correlates closely with acid-leachable iron and manganese. Organic phosphorus was most significant in reducing continental slope sediments, which also contained the highest amounts of organic carbon. Concentrations of dissolved reactive phosphate are similar to those found in shallow water sediments of the same general type. The cores (up to three m long) were taken from deep-sea sediments and seven from the continental slope. Deep-sea sediments with calcium carbonate as the dominate solid component had lower and less-variable dissolved reactive phosphate concentrations than deep-sea sediments with low calcium carbonate content. (Lynch-Wisconsin)
W79-02230

BEST MANAGEMENT PRACTICES TO CONTROL NONPOINT-SOURCE POLLUTION FROM AGRICULTURE,
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W79-02233

A COMPUTER SIMULATION OF PHOSPHATE AND NITROGEN TRANSPORT BY WATER RUNOFF,
Technion - Israel Inst. of Tech., Haifa. Soils and Fertilizers Lab.
G. Kruh, F. Segall, A. Amberger, and J. Hagin.
Zeitschrift fur Pflanzenernahrung und Bodenkunde, Vol. 141, No. 4, p 385-395, 1978. 7 fig, 1 tab, 9 ref.

Descriptors: *Phosphates, *Nitrogen, *Computer models, *Soil erosion, *Water pollution sources, *Agricultural runoff, Rainfall, Rainfall intensity, Simulation analysis, Runoff, Nutrients, Model studies, Fertilizers, Subsurface flow, Drainage, Porosity, Soil physical properties, Hydraulic coefficient, Soils, Saturation, Surface runoff.

A computer model was designed to simulate soil erosion by rain and runoff. The mathematical representation was derived from Meyer and Wischmeier (models of soil detachment by water) and

from Ishihara (model of runoff and surface flow). The model computes the amount of soil and nutrients removed from agricultural field surfaces by erosion in two stages: (1) discharge rate of water on the surface and upper layer of the soil, and (2) contribution of soil detachment and transport by rainfall and runoff to losses of phosphorus, nitrogen, and soil. Computation of surface runoff and subsurface flow in a porous layer is essential for calculating erosion by runoff. Several computer runs with changing parameters illustrated the sensitivity of the model to changes in soil properties and characteristics and rain patterns. The rainfall for one October 1976 day in Haifa, Israel was 59 mm. In a model simulation, doubling that rainfall to 118 mm per day raised the underground water level from 12 to 20 cm, producing theoretical saturation of the supper soil layer. A uniform rainfall results in delay of runoff and a decrease in erosion. Erosion is doubled with an increase in slope steepness from 10 to 30 degrees, lateral water flow increases and underground level decreases. A porous upper soil layer 30 cm deep does not reach saturation in 24 hrs. Decreasing porosity from 43% to 20% produces rapid saturation. An increase in sublayer hydraulic coefficient induces faster drainage and thus prevents saturation of the upper layer and runoff. (Lynch-Wisconsin)
W79-02251

PARTICULATE AND DISSOLVED ORGANIC MATTER IN A SMALL PARTLY FORESTED ONTARIO STREAM,
Waterloo Univ., (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-02252

COMPARISON OF THE PREDICTIVE ACCURACY OF MODELS OF URBAN FLOW AND WATER-QUALITY PROCESSES,
Geological Survey, Bay St. Louis, MS. Water Resources Div. and Geological Survey, Miami, FL. Water Resources Div.
M. E. Jennings, and H. C. Mattraw.
In: Proceedings of National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, held at University of Kentucky, Lexington, Kentucky, July 26-29, 1976. 8 p, 5 fig, 3 tab, 11 ref.

Descriptors: *Peak discharge, *Urban runoff, *Model studies, *Mathematical models, Evaluation, Urbanization, Water quality, Urban hydrology, Storm drains, Surface runoff, Flood frequency, Forecasting.

Peak flow comparisons were made on four small urban catchments ranging in size from 47.8 to 613 acres using three selected stormwater runoff models. Average errors varied from -5 percent to 21 percent for the models. Preliminary studies of pollutant accumulation in one basin indicated pollutant loads can be related to rainfall volume and antecedent dry days with an average correlation coefficient of about 0.70. The surcharging effect of storm drains is indicated in comparisons of peak-flow frequency for one of the catchments studied. (Woodard-USGS)
W79-02253

HYDROLOGY AND WATER BUDGETS OF CYPRESS DOMES,
Florida University, Gainesville, Department of Environmental Engineering Sciences and Center for Wetlands.
K. Heimburg.
In: Third Annual Report on Cypress Wetlands, Floirda University, Center for Wetlands, Gainesville, p 56-67, 1976. 6 fig, 2 tab.

Descriptors: *Swamps, *Waste water, *Hydrologic properties, Wetlands, Water properties, Diffusion, Water table, Topography.

Surface water in a cypress dome is closely coupled to groundwater in the underlying water table aquifer. Usually the domes are a high on the water table, and water spreads radially outward from them recharging the water table. Infiltration from the swamps is governed by the position of the table relative to the surface water, as water tables fall during a dry period, hydraulic gradients around the swamps steepen and infiltration rates increase. Once surface water has moved into the water table aquifer, it moves out of the area under the influene of regional groundwater gradients, is used by the vegetation in areas surrounding the swamps or percolates to deeper aquifers. Surface flow into specific domes is primarily dependent on topography, but no clear relationship between runoff and surface characteristics has been established. When considered for waste water loading, sites should be selected for high infiltration rates. High water tables anywhere near a swamp reduce infiltration; these are associated with hills and slopes, which also increase runoff into the swamps, so flat sites are desirable. Smaller swamps are preferable for the most infiltration from the minimum area of swamp, there is more perimeter per unit surface area for infiltration. (See also W79-02256) (Steiner-Mass)
W79-02257

DISSOLVED HYDROGEN SULFIDE IN SOIL WATER IN SAN FELASCO HAMMOCK AND DEERHAVEN CYPRESS DOME,
Florida Univ., Gainesville. Center for Wetlands.
L. A. Burns.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 780-802, 1976. 2 fig, 3 tab, 14 ref.

Descriptors: *Swamps, *Hydrogen sulfide, Wetlands, Florida, Sulfides, Sulfur compounds, Muck soil.

A sampling reconnaissance of a cypress dome receiving high sulfate waste water from the Deerhaven steam-electric generating plant, and of floodplain soils of Turkey Creek in Sanchez Prairie, was conducted to determine concentrations of hydrogen sulfide dissolved in the soil solution. Background determinations were made for both sulfate and sulfide concentrations at Blue Spring on the Sante Fe River, and in the watershed of Possum Branch, a tributary of Hogtown Creek. Concentrations of hydrogen sulfide of 8 to 12 ppm were found in the soil solution in the Deerhaven dome. Concentrations ranging from 0.09 ppm at the edge of the floodplain to 4.4 ppm in a 'dead-tree' area were found in the Sanchez Prairie area of San Felasco Hammock. In the Possum Branch floodplain, concentrations ranged from 0.09 ppm at the edge of the floodplain to 0.25 ppm near the center of the floodplain. Sulfide concentrations in the vegetated margin of the Blue Spring boil pool and run, and in the Sante Fe River floodplain, ranged from 0.30 to 0.50 ppm. A soft organic deposit along the run had 1.40-2.26 ppm sulfide. (See also W79-02256) (Steiner-Mass)
W79-02285

PRELIMINARY EVALUATION OF FINAL CUT LAKES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5G.
W79-02292

REDUCTION OF NITRATE IN A SOIL COLUMN DURING CONTINUOUS FLOW,
California Univ., Berkeley. Dept. of Biology.
For primary bibliographic entry see Field 2G.
W79-02366

SULFATE TURPENTINE IN UNPURIFIED AND PURIFIED EFFLUENTS FROM THE BAIKAL PULP MILL (SUL'FATNYI SKIPIDAR V NEOCHISHCHENNYKH I OCHISHCHENNYKH STOKAKH BAIKAL'SKOGO TSELLYULOZNOGO ZAVODA),
Gidrokhimicheskii Inst. Novocherkassk (USSR).
T. P. Churilova, L. I. Nomikos, T. N. Pisareva, and G. A. Budakov.
Materialy Vsesoyuznogo Simpoziuma po Sovremennym Problemam Samoochishcheniya i Regulirovaniya Kachestva Vody, 5th, Vol. 3, p 123-125, 1975. 2 ref.

Descriptors: *Pulp wastes, *Turpentine, *Kraft mills, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Foreign countries, Waste water treatment, Gas chromatography, Water analysis, Organic compounds, Terpenes, Soviet Union(USSR), Kraft mills, Lake Baikal(USSR).

Terpene compounds discharged with purified effluents from the Baikal kraft mill (USSR) are oxidized in Lake Baikal more slowly than are terpenes under laboratory conditions simulating those of the lake. This indicates that turpentine components undergo modification during the effluent purification process (involving biochemical and chemical treatments, mechanical purification, and aeration). To study the nature of the modification, gas-liquid chromatographic analyses were conducted of turpentine formed during the kraft cooking process, of turpentine in the effluents at various stages of purification, and of terpene compounds in Lake Baikal. Terpene hydrocarbons predominated in the crude turpentine and in the unpurified effluent. A large amount of volatile terpenes (up to 94%) was found in purified effluent, while the amount of terpene hydrocarbons was low (about 6%). These volatile compounds were also found in the lake. A certain amount of oxygen-containing compounds was found in the purified effluent. (Stapinski-IPC)
W79-02378

CONVERSION OF LIGNOSULFONATES IN NATURAL WATERS (PREVRASHCHENIE LIGNOSUL'FONATOV V PRIRODNYKH VODAKH),
Gidrokhemicheskii Inst., Novocherkassk (USSR).
G. I. Ganin, V. T. Kaplin, and V. A. Kriul'kov.
MAterialy Vsesoyuznogo Simpoziuma po Sovremennym Problemam Samoochishcheniya i Regulirovaniya Kachestva Vody, 5th, Vol. 3, p 13-17, 1975. 7 ref.

Descriptors: *Biodegradation, Lignins, *Sulfonates, *Pulp wastes, Natural streams, Laboratory tests, Microorganisms, Dissolved oxygen, Hydrogen ion concentration, Water pollution, Water pollution sources, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Pollutants, Nitrogen compounds, Phenols, Organic acids, Alcohols, Lignosulfonates.

Laboratory studies of the biochemical degradation of lignosulfonates (LS) isolated from spent sulfite liquor have shown that the process is slow; the LS concentration in natural water was reduced 30% in two weeks, and only 4-5% during the subsequent 25 days. Evidently, the degradation initially involves the low-molecular weight fraction, with the remaining high-molecular weight fractions quit resistant to microorganism attack. The degradation process decreased the dissolved oxygen content and pH of the water, and had a significant effect on the mineral nitrogen content in water; there was an initial increase in the ammonium and nitrite nitrogen contents followed by a reduction of the concentration of these compounds. Phenols, organic acids, and alcohols were formed during LS degradation. Analyses of river water near the discharge site of a pulp and paper mill showed that biochemical degradation of LS does take place, with the intensity of degradation higher in the bottom deposits (where LS accumulates) than in the body of water. (Stapinski-IPC)
W79-02379

PRECIPITATION AND RUNOFF WATER QUALITY FROM AN URBAN PARKING LOT AND IMPLICATIONS FOR TREE GROWTH,
Missouri Univ.-Columbia.
C. H. Pham, H. G. Halverson, and G. M. Heisler.
Department of Agriculture, Forest Service, Research Note NE-253, 6 p, 1978. 15 ref, 4 tab.

Descriptors: *Water quality, *Storm runoff, *Trees, *Precipitation(Atmospheric), *Paving, New Jersey, Runoff, Surface runoff, Water supply, Phosphorus compounds, Lead, Copper compounds, Drainage, Parking lots, Urban runoff.

The water quality of precipitation and runoff from a large parking lot in New Brunswick, New Jersey was studied during the early growing season, from March to June 1976. Precipitation and runoff from 10 storms were analyzed. The runoff was higher in all constituents considered except for P, Pb, and Cu. Compared with published values for natural waters, sewage effluent, and storm-water drainage from urban land, the parking lot runoff was not highly polluted. It appears that such runoff is a satisfactory source of water for urban trees. (Witt-IPC)
W79-02387

WATER-QUALITY MONITORING IN THE AMERICAN URBANIZING SOUTHWEST,
Metcalf and Eddy, Boston, MA.
B. P. Popkin.
Paper presented at International Symposium on Urban Stormwater Management, University of Kentucky, Lexington, July 24-27, 1978, 6 p. 4 tab, 36 ref.

Descriptors: *Water quality, *Monitoring, *Urban hydrology, *Southwest U.S., Baseline studies, Precipitation(Atmospheric), Water pollution, Land use, Soil water, Overland flow, Groundwater movement, Water sampling.

The principles of water quality monitoring required in the fast-growing American Southwest are predicated on the extensive hydrologic and environmental effects of urbanization. As reviewed here, hydrologic events are sporadic in this region, highly variable and ephemeral over changing watersheds, thus requiring that techniques be modified accordingly. Guidelines for monitoring atmospheric precipitation, overland flow, streamflow, point pollutant discharges, soil water, and groundwater are suggested in terms of station selection, sample stabilization, and monitoring problems and solutions. Objectives of monitoring and data evaluation are discussed. The unique problems of water quality monitoring in the arid southwest are solvable, although most solutions depend on creative and flexible planning, training, and communication. (Tickes-Arizona)
W79-02397

WATER QUALITY OF STREAMFLOW FROM FORESTED WATERSHEDS ON SEDIMENTARY SOILS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
P. W. Gregory, and P. F. Ffolliott.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 6, Proceedings, 1976 Meetings of the Arizona Section American Water Res. Assn. and the Hydrology Section, Arizona Academy of Science, April 29-May 1, 1976, Tucson, Arizona. OWRT A-066-ARIZ(1), 14-34-0001-6003.

Descriptors: *Water quality, *Sedimentary soils, *Ponderosa pine forests, *Streamflow, *Arizona, *Forest watersheds, *Heber Watershed(Ariz).

To provide quantitative baseline information on water quality of streamflow from ponderosa pine watersheds on sedimentary soils, water samples were collected at the mouths of four watersheds at time of surface runoff and during extreme or unusual hydrological events. In each sample, calcium (Ca++), magnesium (Mg++) and sodium (Na+) were determined by using atomic absorption spectrophotometry; carbonate (CO=3) and bicarbonate (HCO-3) were measured by titrating with standard acid; fluoride (F-), sulfate (SO=4), 3 nitrate (NO-3), and chloride (Cl-) were determined by colorimetric methods using an Autoanalyzer; hydrogen ion concentration (pH) was measured by using a glass electrode; and suspended sediment concentrations were determined by filtration. The data obtained were compared with EPA water quality standards for aquatic life, irrigation, and public water supply. Although the EPA levels of acceptability have not been established for many of the chemical and physical water constituents, the parameters determined in this study, in general, fall within the EPA prescribed limits. (Hasbrouck-Ariz)
W79-02404

NITRATE REDUCTION BY DENITRIFYING BACTERIA IN SINGLE AND TWO STAGE CONTINUOUS FLOW REACTORS,
Queen's Univ., Kingston (Ontario). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W79-02406

MODEL FOR DECOMPOSITION OF ORGANIC MATERIAL BY MICROORGANISMS,
Utah State Univ., Logan. Ecology Center.
For primary bibliographic entry see Field 2G.
W79-02415

FIELD PERSISTENCE AND MOVEMENT OF TRIFLURALIN IN TWO SOIL TYPES,
Tennessee State Univ., Nashville.
For primary bibliographic entry see Field 2G.
W79-02417

CONSEQUENCES OF SITE DISTURBANCES IN THE UPPER COASTAL PLAIN,
Southern Forest Experiment Station, Oxford, MS. Forest Hydrology Lab.
For primary bibliographic entry see Field 4D.
W79-02431

PROCEEDINGS OF A WORKSHOP ON THE EVALUATION OF MODELS USED FOR THE ENVIRONMENTAL ASSESSMENT OF RADIONUCLIDE RELEASES.
Oak Ridge National Lab., TN.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-770901, Price codes: A07 in paper copy, A01 in microfiche. Report No CONF-770901, April 1978. Workshop held in Gatlinburg, Tennessee, September 6-9, 1977. 131 p, 4 tab, 183 ref, 1 append.

Descriptors: *Mathematical models, *Radionuclides, *Path of pollutants, *Dosimetry, *Radioactivity effects, *Public health, Radioactive fallout, Food chains, Atmospheric pollution, Evaluation, Future planning, Gamma rays, Safety, Waste treatment, Nuclear wastes, Radioactive waste disposal, Water cycle, Lethal limit, Soil contamination, Conferences.

The workshop was held to evaluate the predictive capabilities of the various mathematical models used in radiological assessments. The five major tasks of the workshop were: (1) a critical review of current practices in the environmental assessment of routine accidental releases of radionuclides; (2) the determination of limitations associated with these methods; (3) the identification of critical parameters which may contribute to error in model results; (4) the recommendation of improvements and future research for parameter determination, model development and model validation; and (5) the recommendations of models and parameter values most suitable for future assessments of radioactive releases to the environment. The topics covered by the working sessions were: atmospheric transport; aquatic and food chain transport; terrestrial food chain transport; and internal and external dosimetry. Abstracts for three of the reports are included. (Davison-IPA)
W79-02434

VIRUS TRANSPORT THROUGH SOLID BEDS,
California Univ., Los Angeles. Dept. of Chemical, Nuclear and Thermal Engineering.
S. Sundaram.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 310, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1977, 92 p. 26 fig, 22 tab, 19 ref, 4 append. (California Water Resources Center Project UCAL-WRC-W-523). OWRT B-184-CAL(2).

Descriptors: *Viruses, *Percolating water, *Percolation, *Water pollution sources, *Soil contamination, *Path of pollutants, Virus transport, Model studies, Forecasting, Solid wastes, Waste water disposal, Waste disposal.

A theoretical model for predicting the breakthrough curve of viruses from solid beds is developed. This model includes the percolation of contaminated water through clean solid beds (saturation) and of uncontaminated water through contaminated beds (elution). This model involves the solution of the reaction kinetic form of the adsorption/ion exchange equations when the effects of external mass transfer are important. The principal variables are column volume, volumetric flow rate, fluid volume passing through the column, stoichiometric capacity of the column and particle size. The model has been used to predict the breakthrough curve of the virus T4 bacteriophage on activated carbon where the Langmuir adsorption of T4 bacteriophage on activated carbon was evaluated using literature data. The model predictions agree favorably with qualitative experimental observations reported in the literature for virus breakthrough from activated carbon columns where the variables studied included bed length, flow rate and particle size. Breakthrough curves were also predicted for the transport of f-2 bacteriophage through soil columns using rough estimates of adsorption isotherms from literature data. Although these breakthrough curves were much different from the activated carbon system, the model was also in qualitative agreement with reported experimental observations for these soil systems in both saturation and elution operations. (Snyder-Calif, Davis)
W79-02447

POLLUTIONAL CHARACTERISTICS OF STORMWATER RUNOFF,
Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering.
E. R. Bennett, and K. Linstedt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 309, Price codes: A11 in paper copy, A01 in microfiche. Colorado Water Resources Research Institute, Colorado State University, Fort Collins, Completion Report No 84, September 1978. 207 p, 36 fig, 68 tab, 88 ref. OWRT A-028-COLO(4).

Descriptors: *Storm runoff, Water pollution sources, Colorado, *Waste characteristics, *Snowmelt runoff, Sampling, *Mass loadings(Wastes), Water pollution treatment, Waste water treatment, *Boulder(Colo).

The pollutional characteristics of stormwater runoff were evaluated by sampling stormsewer discharges at three locations. The study was made in Boulder, Colorado and the emphasis was placed on the characteristics of snowmelt runoff. The runoff from three types of land use areas were studied. The sampling locations included a stormsewer outfall for an urbanized residential area with a population density of 25 persons per acre (62 persons per hectare); the outfall of the storm-sewer serving a suburban area with a density of 12 persons per acre (30 persons per hectare) and the runoff from an uninhabited, unsewered mountain watershed. The results showed that pollution from snowmelt is released more slowly than from rain runoff to a receiving stream and therefore the maximum concentrations were lower than those for rainfall. The total mass loadings were slightly lower for snowmelt compared to rain runoff on the same area for the major pollutants, COD, total and suspended solids. The mass loadings were much lower in snowmelt for the nutrients, nitrogen and phosphorus. Preliminary treatment evaluations of stormwater runoff were made using the process of plain sedimentation, coagulation-sedimentation using lime, alum, and ferric chlorides and by sand filtration. Due to the colloidal nature of the organic matter in the stormwater, coagulation-sedimentation and filtration were effective treatment methods but plain sedimentation gave relatively poor results.
W79-02451

ORGANOCHLORINE AND MERCURY RESIDUES IN FISH FROM LAKE SIMCOE, ONTARIO 1970-76,
Ontario Ministry of Agriculture and Food, Guelph. Pesticide Residue Lab.
R. Frank, M. Van Hove Holdrinet, R. L. Desjardine, and D. P. Dodge.
Environmental Biology of Fishes, Vol. 3, No. 3, p 275-285, 1978. 4 tab, 1 fig, 13 ref.

Descriptors: *Polychlorinated biphenyls, *Mercury, *Pesticide residues, *Path of pollutants, *Chlorinated hydrocarbon pesticides, *Freshwater fish, Canada, DDT, DDE, Heptachlor, Insecticides, Fish eggs, Fish reproduction, Lipids, Perches, Food chains, Food webs, Trophic levels, Fish reproduction, Agricultural runoff, Salvelinus, *Lake Simcoe(Ontario), Perca, *HEOD.

Ten species of fish were collected between 1970 and 1976 from Lake Simcoe for organochlorine and mercury analysis. DDT residues significantly declined between 1970 and 1975-76 in all species except small Stizostedion vitreum vitreum and large Salvelinus namaycush. Eggs taken 1975-76 from small S. namaycush had DDT residues below the critical level reported for the production of viable offspring, but this was not so for large members. III OD residues between 1970 and 1975-76 significantly declined in five species and PCB residues declined in all species except the larger Perca flavescens. Chlordane and heptachlor-epoxide were identified in S. namaycush for the first time in 1975-76. Mercury residues showed no change between 1970 and 1975-76 in five species, it declined in two species and increased in small S. v. vitreum. Correlations existed between levels of organic contaminant and lipid content of fish especially in the immediate post period of their use. Where the increasing lipid content was associated with an increasing trophic level a prey-predator relationship existed for contaminant accumulations. However, where lipid contents were low, no correlation appeared to exist in the prey-predator. (EIS-Katz)
W79-02456

FURTHER DATA ON HEAVY METALS AND ORGANOCHLORINES IN MARINE MAMMALS FROM GERMAN COASTAL WATERS,
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Isotopenlaboratorium.
U. Harms, H. E. Drescher, and E. Huschenbeth.
Berichte der Deutschen Wissenschaftlichen Kommission fur Meeresforschung, Vol 26, No 3-4, p 153-161, 1978. 2 tab, 3 fig, 26 ref.

Descriptors: *Heavy metals, Mammals, Aquatic animals, *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Organochlorines, Metals, Path of pollutants, DDT, Polychlorinated biphenyls, Food webs, Copper, Zinc, Cadmium, Lead, Mercury, Food chains, *Harbor seals, Phoca, *Baltic Sea, *Marine mammals.

Studies on heavy metals and organochlorines in harbour seals (Phoca vitulina) were continued and extended to other marine mammals, which were found off the German North Sea and Baltic coasts. The results are compared with contamination levels in fish which form the major food source of the marine mammals investigated. Concentrations of copper, zinc, cadmium and lead in muscle and liver tissues of fish did not differ significantly from corresponding organs of the marine mammals. However, considerably higher amounts of mercury were found in the liver of seals and whales than in fish. Higher mercury concentrations in seals are closely related to the age of the animals. The highest amount of 160 mg/kg (ppm) Hg was found in an adult seal. In contrast to fish a high percentage of total mercury occurs in the inorganic form in seal and whale liver. The degree of contamination with organochlorines (PSB and total DDT) in seals and whales studied so far is of the same order of magnitude. Maximum values in seal blubber amount to 27 mg/kg (ppm) for DDT and 564 mg/kg (ppm) for PCB (wet weight). A comparison of fish and marine mammals shows that the pesticide burden in the various tissues is in the first instance a reflection of their lipid content. Seals form an exception, as the DDT and PCB content is comparably lower in the brain than in the liver which contains less fat. This is probably due to a brain barrier against an accumulation of organochlorines. (EIS-Katz)
W79-02460

UPTAKE, RETENTION AND LOSS OF CADMIUM BY BROWN SHRIMP, (CRANGON CRANGON),
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Inst. fuer Kuesten- und Binnenfischerei.
V. Dethlefsen.
Berichte dew Deutschen Wissenschaftlicher Kommission fur Meeresforchung, Vol 26, No 3-4, p 137-152, 1978. 11 fig, 8 tab, 32 ref.

Descriptors: *Shrimp, *Cadmium, *Absorption, *Path of pollutants, *Commercial shellfish, Crustaceans, Invertebrates, Laboratory tests, Metals, Animal physiology, Estuarine environment, Water pollution effects, Environmental effects, Crangon, *Bioaccumulation, *Depuration, *Brown shrimp.

Crangon crangon were exposed to Cd-concentrations of 5-100 microgr/l in static tests and 1,5-2,5 microgr/l in constant flow through tests. Loss and retention experiments were conducted after an uptake period of 20 days. A rapid shorttime accumulation characterized by the building of an early plateau was followed by a long term accumulation characterized by a linear increase of the total body load. For no concentration of Cd a final equilibrium between body load and water concentration was encountered, but in the 1,5 microgr Cd/l flow through experiment no uptake of Cd by C. crangon could be measured. Major sites of accumulation were gills and hepatopancreas, no significant uptake was found to take place in the abdominal muscle. Cd was incorporated into the exoskeleton. Retention of Cd was very effective after exposure to 5 microgr Cd/l for 20 days, no loss of Cd from the shrimps could be measured in a period of 7 days. Accumulation factors were identical to those calculated for C. crangon living in the Elbe estuary. (EIS-Katz)
W79-02463

ON THE UPTAKE OF THREE DIFFERENT TYPES OF HYDROCARBONS BY SALMON EGGS (SALMO SALAR L.),
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W79-02464

THE NUTRIENT CONTENTS OF NORTH SEA WATER: CHANGES IN RECENT YEARS, PARTICULARLY IN THE SOUTHERN BIGHT,
Nederlands Inst. voor Onderzoek der Zee, Texel.
H. Postma.
Rapports Et Proces-Verbaux Des Reunions Conseil International Pour L'Exploration De La Mer, Vol. 172, p 350-357, 1978. 6 fig, 21 ref.

Descriptors: *Nutrients, *Phosphates, *Nitrates, *Silicates, Water chemistry, Water analysis, Seasonal, Growth rates, Phytoplankton, Diatoms, Chemical analysis, Primary productivity, Eutrophication, Trophic level, Productivity, *North Sea.

This paper reports the nitrate, silicate, and phosphate content of North Sea waters as well as basic parameters such as salinity, oxygen content, transparency and currents. Data is presented on seasonal variations and changes over the last 25 years. (EIS-Deal)
W79-02468

A METHOD OF PREDICTING THE BIOLOGICAL EFFECTS OF SYNTHETIC POLLUTANTS IN THE NORTH SEA,
Danmarks Fishkeri- og Havundersogelser, Charlottenlund.
For primary bibliographic entry see Field 5C.
W79-02470

GROWTH-INFLUENCING SUBSTANCES IN SEDIMENT EXTRACTS FROM A SUBTROPICAL WETLAND: INVESTIGATION USING A DIATOM BIOASSAY,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL. Div. of Biology and Living Resources.
For primary bibliographic entry see Field 5C.
W79-02476

ORGANCHLORINES IN CODFISH FROM HARBOURS ALONG THE NORWEGIAN COAST,
Norges Veterinarhoegskole, Oslo. Dept. of Pharmacology and Toxicology.
For primary bibliographic entry see Field 5C.
W79-02479

THE POLLUTION OF SEA-WATER IN NAGASAKI BAY IN SUMMER 1976 AND 1977, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
S. Miyahare, and H. Ohno.
Bulletin of the Faculity of Fisheries, Nagasaki University, No. 45, p 29-31, 1978. 1 fig, 2 tab, 4 ref.

Descriptors: *Chemical oxygen demand, *Suspended solids, *Cadmium, *Lead, *Mercury, Organic compounds, Heavy metals, Sea water, Water quality, Water chemistry, Chemical analysis, Dissolved oxygen, Salinity, Water temperature, Hydrogen ion Concentration, *Arsenic, *Nagasaki Bay(Japan).

Following a previous report in 1975, we conducted an examination of the pollution of sea-water in Nagasaki Bay in summer 1976 and 1977 to check the environmental changes in the bay. Although chemical oxygen demand was inclined to decrease yearly, suspended solids increased considerably, probably because of the increased dust in the seawater. N-hexane extracts showed a trend of gradual increase. Cadmium and lead were detectd, though they were not detected in 1975. Mercury and arsenic decreased yearly during the period of this investigation. (EIS-Deal)
W79-02482

EFFECT OF BARITE (BASO4) ON DEVELOPMENT OF ESTUARINE COMMUNITIES,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W79-02484

INSECTICIDE PERSISTENCE IN NATURAL SEAWATER AS AFFECTED BY SALINITY, TEMPERATURE, AND STERILITY,
Gulf Coast Research Lab., Ocean Springs, MS. Microbiology Section.
W. W. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 605, Price codes: A02 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-78-044 April 1978, 25 p, 8 tab, 4 fig, 23 ref.

Descriptors: *Insecticides, Pesticides, *Chlorinated hydrocarbon pesticides, Phosphothionate pesticides, Water temperature, Sea water, Salinity, Sterility, *Malathion, *Parathion, *Methylparathion, *Diazinon, *Methyloxychlor, Gas chromatography, Degradation, Decomposition, Microbial degradation.

The effect of temperature, salinity, and sterility on the degradation of malathion, parathion, methyl parathion, diazinon, and methoxychlor in fresh and estuarine water has been determined under controlled laboratory conditions. Surface water samples of 1, 10, 20, and 28 ppt salinity were amended with the above insecticides and incubated in the dark at 30, 20, and 10C under sterile and nonsterile conditions. Insecticide abatement was followed by electron-capture gas-liquid chromatographic techniques. No significant differences between sterile and nonsterile treatments were observed for any of the insecticides studies, while the effect of increas-

ing temperature was highly significant with regard to increased degradation of malathion, parathion, methyl parathion, and diazinon. Methoxychlor reflected the recalcitrance characteristic of the chlorinated hydrocarbon insecticides throughout 84 days of incubation and was not significantly affected by salinity, temperature, or sterility. Salinity effects were varied among the four organophosphates, being highly significant for malathion and diazinon, significant for methyl parathion, and not significant for parathion. (EIS-Katz)
W79-02487

THE URQUIOLA OIL SPILL, LA CORUNA, SPAIN: IMPACT AND REACTION ON BEACHES AND ROCKY COASTS,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5C.
W79-02500

5C. Effects Of Pollution

SIGNIFICANCE OF NITRIFICATION IN STREAM ANALYSIS-EFFECTS ON THE OXYGEN BALANCE,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
M. S. Finstein, P. F. Strom, and V. A. Matulewich.
Journal of the Water Pollution Control Federation, Vol. 50, No. 8, August 1978, p 2055-2057. 1 fig, 12 ref.

Descriptors: *Nitrification, Streams, *Dissolved oxygen, *Biochemical oxygen demand, *Mathematical models, *Nitrogen fixing bacteria, Nitrogen cycle, Model studies, Bacteria, Plankton, Benthos, Grand River(MI), Michigan, Passaic River(NJ), New Jersey, Nutrients, Waste water disposal, Waste water treatment.

A retrospective critique of Courchaine's 1968 paper on effects of nitrification in streams on oxygen balance contends that nonplanktonic nitrifying organisms associated with the streambed probably account for the high rate of nitrification observed just below the wastewater treatment outfall in the Grand River, Michigan. In the study, the course of nitrate accumulation in the river below the outfall did not resemble the course of nitrification-induced oxygen uptake during laboratory incubations. In the river, nitrate accumulation was underway 0.05 days downstream and two-thirds of the effluent nitrogenous load was accounted for in terms of nitrate at a point 0.73 days downstream. Location of nitrifying bacteria in the receiving stream determines the appropriate type of mathematical stream model. An autocatalytic model is suitable for streams with planktonic nitrifyers, where nitrification is delayed until the nitrifying population expands in response to ammonium enrichments. For nonplanktonic nitrifiers, a model based on zero-order kinetics is appropriate; in this case nitrification begins immediately below outfall. Courchaine's paper clearly demonstrates that nitrification can be an important mechanism in removal of DO from receiving streams. (Lynch-Wisconsin)
W79-02001

THE EFFECTS OF WEED-CUTTING ON THE MACRO-INVERTERATE FAUNA OF A CANALISED SECTION OF THE RIVER HULL, A NORTHERN ENGLISH CHALK STREAM,
James Cook Univ. of North Queensland, Townville (Australia). Dept. of Zoology.
R. G. Pearson, and N. V. Jones.
Journal of Environmental Management, Vol. 7, No. 1, p 91-97, July, 1978. 4 tab, 8 ref.

Descriptors: *Environmental effects, *River Hull(England), *Mechanical control, *Aquatic weed control, *Invertebrates, *Aquatic animals, Chalk streams, England, Rivers, Canals, Drainage, Insects, Summer, Faunal lists, Ranunculus fluitans, Potamogeton, Cladophorea, Fish, Benthic fauna.

Cutting and removal of large amounts of vegetation and its associated invertebrate fauna from the River Hull, a chalk stream in northern England, resulted in: (1) removal of significant numbers of animals in the weeds, (2) an increase in activity of many benthic faunal species, and (3) increased drifting of some plant-dwelling animals. The increase in activity was probably due to both general habitat disturbance and influx to the bottom populations of animals escaping from the cut weed. Long-term effects are considered to be minimal, though effects could vary with the timing of cutting, and fish populations could be adversely affected by weed cutting. The operation referred to the great ability of stream communities to recover from disturbance. In the section of the canalized river investigated, the river had an approximate width of 20 m, a depth of 0.5-1.5 m, and current velocity of 10-20 cm/sec, and a substream of coarse sand and silt. A list of 26 taxa of fauna found on Ranunculus fluitans, Potamogeton spp, Cladophora sp., and several drifting plant species is given. Other common plant species include Ranunculus aquatilis, Fontinalis antipyretica, Oenanthe fluviatilis, Groenlandia densa, Ceratophyllum demersum, and Hippuris vulgaris. (Lynch-Wisconsin)
W79-02002

A SURVEY OF PHOSPHORUS AND NITROGEN LEVELS IN TREATED MUNICIPAL WASTEWATER,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5A.
W79-02003

AMMONIUM OXIDATION AND ITS SIGNIFICANCE IN THE SUMMER CYCLING OF NITROGEN IN OXYGEN DEPLETED SKAN BAY, UNALASKA ISLANDA, ALASKA,
Tokyo Univ. (Japan). Ocean Research Inst.
A. Hattori, J. J. Goering, and D. B. Boisseau.
Marine Sciences Communications, Vol. 4, No. 2, p 139-151, 1978. 3 fig, 2 tab, 8 ref. NSF GA-37963.

Descriptors: *Skan Bay(AK), *Ammonium, *Oxidation, *Oxygen depletion, *Nitrogen, *Anaerobic conditions, Alaska, Denitrification, Bays, Cycling nutrients, Nitrites, Nitrates, Nutrients, Phytoplankton, Algae, Pycnocline, Biochemical oxygen demand, Bacteria.

A study in Skan Bay (Unalaska Island, Alaska) August 1972 showed that ammonium oxidation proceeds in the entire water column, including in the oxygen-depleted waters below 35 m. The daly amminium oxidation rate in the stagnant water below 35 m was estimated at 150 mg N/sq m/day from decreases in ammonium and 100 mg N/sq m/day from increases in nitrite and nitrate. Observations suggest the nitrite was produced by bacterial oxidation of ammonium, and the decrease in nitrate near the bottom shows sediments act as a nitrate sink in the summer. Nitrate was reduced to nitrite and ammonium in the near-bottom water, but at a less intensive rate than the ammonium oxidation. Four-day bottle incubation and tracer experiments using nitrogen-15 ammonium yielded results consistent with rates of ammonium oxidation estimated from 18-day observations of water column concentration changes. Rates of oxidation below 35 m were comparable to production of organic nitrogen by phytoplankton in the euphotic zone. A shallow sill at 10 m depth at the mouth of the bay's western arm retards water exchange between the inner and outer bay; maximum depth of the inner bay is 63 m. During summer a seasonal pycnocline at 25 m prevents vertical convention; water below 35 m is thereby effectively isolated. By late September near-bottom water is depleted of oxygen by biochemical oxygen utilization, and anoxic bacteria flourish which use nitrate and sulfate in respiration. (Lynch-Wisconsin)
W79-02004

EFFECTS OF FOREST WORKINGS ON STREAMFLOW AND WATER QUALITY (PART I),
Forestry and Forest Products Research Inst., Tokyo (Japan). Div. of Forest Influences.
N. Nakano.
Japan Agricultural Research Quarterly, Vol. 11, No. 4, p 246-253, October 1977. 7 fig, 1 tab, 4 ref.

Descriptors: *Forest watersheds, *Forest management, *Lumbering, *Environmenta effects, *Japan, *Streamflow, *Water pollution sources, Streams, Forests, Recreation, History, Evapotranspiration, Clear cutting, Infiltration, Interception loss, Precipitation, Runoff.

Major results of forest hydrological experiments conducted since 1935 at Japan's Forestry and Forest Products Research Institute are outlined. Streamflow and water quality are affected by activities as forest planting, herbicide spraying, fertilization, road building, recreation, and most importantly, logging. Recreation is likely to cause the major future problems. Two types of experiments are reported: (1) hydrological functioning of forests (interception loss, evapotranspiration, and infiltration capacity of forest land), and (2) effects of forest use on runoff (effects of clear cutting on water yield, high streamflow, and low streamflow; reasons for changes in high streamflow after cutting; and the relationship between forest vegetation and high and low streamflow). Interception loss varied with forest type, precipitation, and other climatic conditions, and for a coniferous forest canopy loss was 15-20% annual net precipitation, under-growth loss was about 1 mm/storm, and liter loss was 2-4 mm. Evapotranspiration accounted for mean annual water loss of 400-1100 mm for 6.6-645 ha mixed forest watersheds. Clear cutting and logging increased annual runoff and its percentage of annual precipitation; runoff increases ranged 10-45%. Quickflow increased after cutting, due in part to increased surface runoff resulting from compaction by logging. Low streamflow increases are probably due to diminished transpiration after cutting. (Lynch-Wisconsin)
W79-02005

A DYNAMIC LAKE MODEL FOR TROPHIC STATE PREDICTION,
Eidgenoessische Anstalt fuer Waserversorgung, Abwasserrinigung und Gewaesserschutz, Zurich (Switzerland).
D. M. Imboden, and R. Gachter.
Ecological Modelling, Vol. 4, No. 2-3, 77-98, 1978. 9 fig, 5 tab, 16 ref.

Descriptors: *Trophic level, *Lakes, *Mathematical models, *Primary productivity, *Phosphrous, *Eutrophication, *Simulation analysis, Lake restoration, Forecasting, Dynamic models, Phosphates, Nutrients, Algae, Phytoplankton, Switzerland, Washington, Lake Washington(WA), Alpnachersee(Switzerland), Greifensee(Switzerland), Time, Depth, Aeration, Destratification, Hydraulic residence time, Diversion, Water pollution effects, Diffusion.

A dynamic, one-dimensional vertical model for phosphate and particulate phosphrous simulates the relationship between phosphrous loading and primary production per unit lake area, as a measure of a lake's trophic state. Primary production per unit lake area is described by a nonlinear function of phosphate and particulate phosphorus which accounts for Michaelis-Menten saturation and algal self-shading. The model includes lake morphometry, hydraulic loading, respiration rate, sedimentation, vertical eddy diffusion, thermocline depth, and phosphorus exchange at the sediment-water interface. The model was applied to Alpnachersee and Greifensee in Switzerland and Lake Washington in Washington state, and good agreement was found between observation and the calculation of phosphorus variations as a function of time and depth. The calibrated model predicted the effectiveness of various eutrophication control measures, such as reduction of phosphrous loading, discharge of hypolimnetic water, hypolimnion aeration, and destratification. For Greifensee, with a mean residence time of 1.2 years, reduction in phosphorus loading to 20% current level is needed to achieve permanent aerobic conditions throughout the lake; other measures result in only minor improvements. The model simulates well the observed recovery of Lake Washington following sewage diversion 1963-67. (Lynch-Wisconsin)
W79-02006

EXAMINATION OF A LAKE MODEL,
Royal Danish School of Pharmacy, Copenhagen.
S. E. Jorgensen, H. Mejer, and M. Friis.
Ecological Modelling, Vol. 4, No. 2-3, p 253-278, 1978. 11 fig, 12 tab, 23 ref.

Descriptors: *Eutrophication, *Mathematical models, *Lyngby Lake(Denmark), *Glumso Lake(Denmark), *Simulation analysis, *Lakes, Model studies, Computer programs, Denmark, Nutrients, Parameters, Waste water disposal, Water pollution effects, Dynamic models, Phosphorus, Nitrogen, Organic matter, Forcing functions, Environmental effects, Ecosystems, Equations.

A eutrophication model previously described and calibrated is further validated and recalibrated with data from Lyngby and Glumso Lakes, Denmark. Glumso Lake was used in the original study, and the present paper makes use of an additional year of data from that lake. Lyngby Lake received treated wastewater 1952-58, which contained a high nutrient concentration. The model was used to simulate changes in Lyngby Lake 1959-75 following diversion of the wastewater to the sea in 1959. The model closely describes the lake's response, and generally appears to accurately represent long-term changes and changes in average and maximum values caused by alterations in forcing functions. The model needs to be improved for use in describing annual cycles, but can be used for setting up environmental impact statements. Some aspects of the model were modified to permit investigation of effects of applying submodels which better describe actual ecosystem processes. Sensitivity analysis of one modification was carried out to estimate the importance of parameters, and results were used to calibrate the model more systematically. An automatic computer calibration was tested on four versions of the model, and a subsequent validation was compared with each version. An itemized list is given of state variables, differential equations, rates, limiting factors, other equations, parameter values, and forcing functions of model II. (Lynch-Wisconsin)
W79-02007

A SIMULATION MODEL FOR PHYTOPLANKTON GROWTH AND NUTRIENT CYCLING IN EUTROPHIC, SHALLOW LAKES,
N. Nyholm.
Ecological Modelling, Vol. 4, No. 2-3, p 279-310, 1978. 5 fig, 7 tab, 30 ref.

Descriptors: *Lakes, *Phytoplankton, *Mathematica models, *Cycling nutrients, *Eutrophication, *Simulation analysis, *Water management(Applied), Denmark, Shallow water, Model studies, Phosphorus, Nitrogen, Algae, Plant growth, Nutrients, Dynamic models, Guden River Basin(Denmark), Funen Island(Denmark), Limiting factors, Seasonal, Forecasting, Primary productivity, Sewage disposal, Retention time.

A dynamic model which simulates phytoplankton growth and phosphorus and nitrogen cycling in shallow eutrophic lakes give reasonably good results, at least for lakes with short hydraulic retention times. The model is intended only to describe average conditions over a time scale of several days. It describes a seasonal cycle in a lake assumed to be in equilibrium regarding nutrient inputs for one year and predicts future equilibrium for effects of altered inputs. The model is relatively simple and data requirements are fairly modest; it is designed primarily for practical application, and may be used for environmental management. It has been used to simulate 12 Danish lakes, seven on the island of Funen and five in the Guden River basin. Two of the latter were subdivided, Lake Silkeborg Langsoe into three boxes and Lake Tange into two. Most parameter values were common to all simulations, while a few key parameters were allowed to vary somewhat. Where larger deviations were necessary, reasonable explanations could usually be given. Parameter values and selected numerica results (such as primary productivity) are given for all simulations performed. Simulations of Lakes Braendegaard, Noerre, and Arreskov were unsatisfactory because it was forseen that nitrogen would become a growth-limiting factor. (Lynch-Wisconsin)
W79-02008

ORGANISM PATCHINESS IN LAKES RESULTING FROM THE INTERACTION BETWEEN THE INTERNAL SEICHE AND PLANKTONIC DIURNAL VERTICAL MIGRATION,
Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.
D. Kamykowski.
Ecological Modelling, Vol. 4, No. 2-3, p 197-210, 1978. 7 fig, 15 ref.

Descriptors: *Vertical migration, *Seiches, *Plankton, *Diel migration, *Lakes, *Computer models, Patchiness, Distribution, Zooplankton, Phytoplankton, Equations, Model studies, Computer programs, Windemere(England), England, Stratification, Winds, Predation, Pycnocline, Algae.

Computer models tested Colebrook's conclusion (in a 1960 study of the Windemere, England internal seiche) that wind and the internal seiche combined with diurnal vertical migration of plankton through the thermocline should have a permanent effect on the horizontal distribution of organisms. The observed temporal and spatial patchiness of organisms is influenced by : (1) sampling interval, (2) frictional damping of the basin, (3) phase angle between the seiche and the daylight cycle of vertical migration, (4) organism behavior patterns, and (5) organism swimming speed. Migrating organisms that exclusively reside in either the epilimnion or hypolimnion are affected by currents in the respective layers; the resulting horizontal patchiness is temporary since these organisms maintain a continuous relationship with the same water column. Organisms that cross between layers during their diurnal vertical migration change water columns with each transit and thus can form permanent patches. In Windemere these permanent patches daily vary in strength depending on the current exposure experienced by organisms capable of various swimming speeds. Predator-prey encounters between phytoplankters swimming at 1.5 m/hr and zooplankters swimming at 4 m/hr were investigated. These migration interactions may have an important effect on growth and survival of phytoplankton or zooplankton populations. (Lynch-Wisconsin)
W79-02009

EFFECTS OF NITRATE CONCENTRATION ON THE GROWTH AND PHYSIOLOGY OF LOMINARIA SACCHARINA (PHAEOPHYTA) IN CULTURE,
Dalhousie Univ., Halifax (Nova Soctia). Dept. of Biology.
A. R. O. Chapman, J. W. Markham, and K. Luning.
Journal of Phycology, Vol. 14, No. 2, p 195-198, 1978. 5 fig, 1 tab, 16 ref.

Descriptors: *Nitrates, *Laminaria saccharina, *Plant growth, *Plant physiology, *Limiting factors, *Nutrients, Nitrogen, Carbon, Chlorophyll, Phaeophyta, Algae, Cultures, Half-saturation constant, Photosynthesis, Satuartion, Helgoland(West Germany), West Germany, St. Margaret's Bay(Nova Scotia Canada), Canada, Nova Scotia(Canada), North Sea, Seas, Bays, Solar radiation.

The growth response of the brown alga Laminaria saccharina to various nitrate concentrations in laboratory culture was approximately linear up to 10 microM substrate concentration. The half-saturation constant (K sub s) was about 1.4 microM NO3. Internal nitrate levels increased at substrate concentrations above 10 microM NO3 and reached levels several thousand times higher than the surrounding medium, indicating luxury nitrate consumption. Chlorophyll content and photosynthetic capacities of the plants also increased with increasing external nitrate. Sporophytes of L. saccharina were grown in flow-through enriched and synthetic media with nitrate concentrations of 0,3,10,20,100, and 500 microM. Gametophytes were obtained from parental saturation level for growth (about 10 microM NO3) is within the range found at Helgoland. In the experiments at the two flow rates tested (3.3 and 1.6 liters/day) growth rates were not significantly different. Comparison of the results to Laminaria populations in St. Margaret's Bay, Nova Scotia, Canada, suggests that in winter, light is the limiting factor since nitrate is stored internally, but nitrate is probably limiting in spring and summer when irradiance increases. (Lynch-Wisconsin)
W79-02010

POTENTIAL IMPORTANCE OF BENTHIC CYSTS OF GONYAULAX TAMARENSIS AND G. EXCAVATA INITIATING TOXIC DINOFLAGELLATE BLOOMS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
Journal of Phycology, Vol. 14, No. 2, p 224-234, 1978. 21 fig, 3 tab, 28 ref.

Descriptors: *Red tide, *Gonyaulax tamarensis, *Gonyaulax excavata, Hypnocysts, *Growth stages, *Reproduction, Cysts, Algae, Phytoplankton, Dinoflagellates, Eutrophication, Estuaries, *Cape Cod(MA), Massachusetts, Toxicity, Toxins, Chelation, Motility, Light, Canada, New England, Pellicle cyst, Plant growth, Life cycles, Sediments.

Thick-walled, nonmotile cysts ('hypnocysts') of two toxic, red tide dinoflagellates isolated from estuarine sediments at Cape Cod, Massachusetts are concluded to be important in seeding the recurrent annual blooms, synchronizing early bloom development with vernal warming of seawater, and increasing the geographic range of the species. The species were identified as Gonyaulax tamarensis (Falmouth district) and G. excavata (Orleans district) after the hypnocysts were germinated to produce their motile, thecate stages. Laboratory incubation of the hypnocysts at 16 C, which had been stored in the dark at 5 C for 6 mo, initiated excystment by the temperature increase, with no appreciable effect from light regime, nutrient, or chelator concentrations. Germling motility was optimum in highly chelated medium and eastern Canadian waters are initiated through the displacement of motile estuarine populations into nearshore areas by tidal advection and surface runoff, although the potential existence and importance of offshore cyst reservoirs cannot be discounted. Evidence is presented that hypnocysts are probably sexual zygotes, whereas the thin-walled cysts readily formed in laboratory cultures (pellicle cysts) are asexual. Pellicle cysts are of limited durability, do not overwinter in nature, and therefore do not play a significant role in initiating toxic blooms. (Lynch-Wisconsin)
W79-02011

TROPHIC STRUCTURE MODIFICATIONS BY PLANKTIVOROUS FISH IN AQUATIC MICROCOSMS,
California Univ., Berkeley. Lawrence Berkeley Lab.
A. Jassby, J. Rees, M. Dudzik, D. Levy, and E. Lapan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 342, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/7-77-096, August 1977. 18 p, 2 tab, 14 ref. EPA-IAG-DS-E681/Contract No. 77BCC.

Descriptors: *Trophic level, *Fish, *Planktivores, *Eutrophication, *Zooplankton, *Predation, *Food webs, Phytoplankton, Algae, Mosquito fish, Gambusia affinis, Simocephalus vetulus, Alona guttata, Cladocera, Grazing, Rotifers, Carbon, Nitrogen, Phosphorus, Nutrients, Organic compounds, Inorganic compounds, Chlorophyll, Anabaena, Research equipment, Microcosms.

Addition of two 2.5-cm zooplanktivorous mosquito fish (Gambusia affinis) to two of four 700-liter freshwater microcosms shifted zooplankter dominance from the large cladoceran Simocephalus vetulus to the smaller Alona guttata. The resultant decrease in grazing pressure raised phytoplankton

and bacteria levels, in turn increasing rotifer biomass. In tanks with Gambusia, particulate organic carbon concentration was higher and dissolved inorganic nitrogen concentration lower than in the controls, reflecting a net shift of nutrients from inorganic to organic, presumably due to smaller zooplankton respiratory losses. In the microcosms with fish, ratios of particulate to dissolved organic carbon, and of phytoplankton carbon, and of phytoplankton carbon to chlorophyll-a, were unnaturally high. In all four systems there was an increase in total nitrogen, probably caused by heterocystous Anabaena sp and not by the presence of Gambusia. Each microcosm, consisting of a fiberglass cylinder 1.2 m in diameter, was filled to a depth of 60.1 cm with demineralized water, then enriched with a modified common freshwater algal growth medium and inoculated with a 3.5-liter water sample from small, eutrophic Lake Anza in Berkeley, California. Nutrient enrichment levels are sufficient for eventual nitrogen limitation of algal growth, and the initiation conditions give rise to a phytoplankton bloom that is terminated by zooplankton grazing within two months. (Lynch-Wisconsin)
W79-02013

ROLE OF INORGANIC IONS IN CONTROLLING SEDIMENTATION RATE OF A MARINE CENTRIC DIATOM DITYLUM BRIGHTWELLI,

California Univ., Santa Barbara. Dept. of Biological Sciences.
L. W. J. Anderson, and B. M. Sweeney.

Journal of Phycology, Vol. 14, No. 2, p 204-214, 1978. 14 fig, 3 tab, 50 ref. NSF GB-35247.

Descriptors: *Ditylum brightwelli, *Ion transport, *Sedimentation rates, *Diel migration, *Biorhythms, *Diatoms, Algae, Inorganic compounds, Ions, Marine algae, Centric diatoms, Potassium, Sodium, Chlorine, Magnesium, Calcium, Photoperiodism, Darkness, Light, Buoyancy, Vacuoles, Settling velocity, Phytoplankton.

The settling rate of the marine centric diatom Ditylum brightwelli is shown to be controlled by intracellular levels of potassium, sodium, and chlorine ions; no significant change in magnesium or calcium ions was found. Cells at the end of the dark period had high sodium (118 mM), low potassium (64 mM), and low chlorine (117 mM) ion levels compared with levels at the end of the light period when sodium was low (101 mM), and potassium, (126 mM) and chlorine (154 mM) were high. Magnesium (16-18 mM) and calcium (3-4 mM) remained relatively unchanged. The net result of the ion changes during the light period is to increase cell density by about 3.4 mg/ml, which can account for the increase in settling rate of about 0.3 m/day during the same interval. The density of the cell contents, calculated from observed ion concentrations, is 15-18 mg/ml less than that of the seawater medium. The ion and settling rate changes are light-dependent and do not persist in the dark or under constant light (about 850 lx), but cells do exhibit a free-running circadian rhythm in cell division under continuous dim illumination. The cell vacuole expands during the light period and contracts during the dark, apparently in response to the net ion fluxes. D. brightwelli appears to regulate its density by active ion selectivity accompanied by trans-vacuolar water movement. Axenic batch cultures of the alga were maintained in three-liter flasks containing 1-1.5 liters of enriched seawater medium IMR at 20C on an 8:16 light-dark cycle. (Lynch-Wisconsin)
W79-02014

KINETICS OF PHOSPHATE UPTAKE BY AQUATIC MICROORGANISMS: DEVIATIONS FROM A SIMPLE MICHAELIS-MENTEN EQUATION,

Wisconsin Univ.-Madison. Dept. of Soils.
E. J. Brown, R. F. Harris, and J. F. Koonce.

Limnology and Oceanography, Vol. 23, No. 1, January 1978, p 26-34. 5 fig, 1 tab, 38 ref. NSF AG-199 BMS76-00761 193-69.

Descriptors: *Kinetics, *Michaelis-Menten equations, *Phosphates, *Absorption, *Microorganisms, *Eutrophication, Equations, Selenastrum capricornutum, Algae, Phytoplankton, Inorganic compounds, Radioisotopes, Lake Wingra(WI), Wisconsin, Bioassay, Mathematical studies.

Uptake kinetics of dissolved inorganic phosphate (31P sub i) by lake water microorganisms and by the green alga Selenastrum capricornutum determined as a function of uptake rates of radiophosphate (32P sub i), at added 31P sub i levels > or = 0, did not follow a simple Michaelis-Menten equation. The equation used was: C/v*=A/V+(K sub v + S sub n)/V. Axenic cultures of S. capricornutum were maintained in PAAP medium, and large volumes of water from the surface of small, eutrophic lake Wingra (Madison, Wisconsin) were used for 31P sub i uptake kinetic evaluations. For the lake water sample, deviations of 31P sub i uptake from the equation shown by the curvilinear responses of the plots of C/v* vs. A can be interpreted as caused by the presence of different microorganisms with varying half-saturation constants for uptake of 31P sub i. Similarly, such a curvilinear response for the axenic green alga is consistent with its having more than one system for phosphate uptake, with differing half-saturation constants. While uptake rates obtained from high level 31P sub i-perturbation experiments are generally hyperbolic versus the added 31P sub i uptake rates as estimated by back-extrapolations assuming adherence to a simple Michaelis-Menten equation must be otherwise verified. This is particularly true for the very low 31P sub i levels common in 31P sub i-limited aquatic ecosystems. (Lynch-Wisconsin)
W79-02016

A MATERIAL BALANCE STUDY OF POLYCHLORINATED BIPHENYLS IN LAKE MICHIGAN,

Dow Chemical Co., Midland, MI. Environmental Science Research Lab.
W. B. Neely.

The Science of the Total Environment, Vol. 7, p 117-129, 1977. 1 fig, 4 tab, 22 ref, 1 append.

Descriptors: *Lake Michigan, *Polychlorinated biphenyls, *Mathematical models, *Water pollution source, *Sediment-water interfaces, Model studies, Absorption, Deposition(Sediments), Chemical degradation, Distribution patterns, Estimating equations, Path of Pollutants, Industrial wastes.

A proprietary study was made (1) to identify possible input sources necessary to maintain observed polychlorinated biphenyl (PCB) levels in the Lake Michigan biomass; and (2) to develop a mathematical model that could predict trends in distribution of these chemicals introduced into the lake environment. By integrating known chemical and physical properties of PCB with a mathematical model describing their behavior in the lake the following conclusion was reached: Persistent high levels of PCB in Lake Michigan are not caused by municipal or industrial waste discharge, or fall-out from rain and snow, but are the result of PCB released from lake bottom sediments. Prior to 1970 there was a large input of PCB into Lake Michigan. Due to inertness and high absorption coefficient, the material accumulated in bottom sediments. Since 1970, with a decrease of dispersive uses, the accumulated material is now serving as a major input source into the water. Due to the long time constants it will take several years for the Lake Michigan ecosystem to clean itself. The main factor behind this cleansing action is the concentration gradient that exists in the air/water interface. (Harris-Wisconsin)
W79-02017

APPLICATION OF A MODEL OF ZOOPLANKTON COMPOSITION TO PROBLEMS OF FISH INTRODUCTIONS TO THE GREAT LAKES,

State Univ. of New York at Albany Dept. of Biological Sciences.
D. C. McNaught, and D. Scavia.

Rensselaer Fresh Water Institute Report No. 77-4, 1977. 4 fig, 5 tab, 30 ref. Also in: Modeling Biochemical processes in Aquatic Ecosystems, p. 281-304. 4 fig, 5 tab, 30 ref. NSF AG-199, BMS 69-01147-A09.

Descriptors: *Lake Michigan, *Lake Ontario, *Mathematical models, *Predation, *Fish, *Zooplankton, *Simulation analysis, Eutrophication, Succession, Species composition, Great Lakes, Lakes, Alewife, Alosa pseudoharengus, Bosmina longirostris, Daphnia, Diaptomus, Simulation analysis, Model studies, Water management(Applied), Seasonal, Size, Detritus, Food habits, Algae, Phytoplankton, Population dynamics, *Bioindicators.

A simple two-equation model was used to examine the relative importance of size selection by fish predators on zooplankton in Lakes Michigan and Ontario, as well as effects of nonuniform seasonal inshore distribution of the fish upon both zooplankton composition and abundance. The simulations imply that: (1) fish predation is the principal factor controlling zooplankton composition, (2) Bosmina logirostris is an indicator of predatory pressure and not solely of advanced eutrophication or shifts to larger algal species, and (3) inshore alewife (Alosa pseudoharengus) spawning populations in May and June largely determine summer zooplakton composition. Model inputs include: (1) available phytoplankton and detrital food resources, (2) food selectivity of zooplankton, and (3) size-selective predation by fishes (fish biomass times selectivity). Fish predation is the primary determinant of zooplankton species succession, while algal productivity influences relative species abundance. The model's real-time output can easily be used to determine when the system had reached steady-state, the main criterion in determining when to examine community composition; the output provides estimates of zooplankton and resource numbers at intervals. The model as calibrated for Lake George, New York (reported elsewhere), and is used here to simulate predation by alewife (and salmonids in Lake Michigan prior to 1954) on three common crustaceans: Diaptomus spp, Daphnia spp, and B. longirostris. (Lynch-Wisconsin)
W79-02020

PREDICTION OF PHYTOPLANKTON PRODUCTIVITY IN LAKES,

Environmental Monitoring and Support Lab., Las Vegas, NV.
V. W. Lambou, L. R. Williams, S. C. Hern, R. W. Thomas, and J. D. Bliss.

In: Report EPA 600-9-76-016, Proceedings of the Conference on Environmental Modeling and Simulation, p 696-700, July 1976. 1 tab, 26 ref.

Descriptors: *Classification, *Lakes, *National Eutrophication Survey, *Phytoplankton, *Chlorophyll, *Primary productivity, *Eutrophication, *Phosphorus, Algae, Forecasting, Hydrology, Hydraulic residence time, Nutrients, Ammonia, Parameters, Limiting factors, Nitrogen, Stratification, Macrophytes, Water pollution effects, Trophic levels, Reservoirs, Bioassay.

1972 National Eutrophication Survey data were used to help establish lake classes and determine relationships between ambient nutrients and lake water quality by lake type. Phosphorus correlated most strongly with phytoplankton productivity as measured by yearly mean chlorophyll-a levels. Sixty-nine lakes were classified as phosphorus-limited (N/P >14), 44 as transitional (N/P between 10-14), and 79 as nitrogen-limited (N/P <10). Chlorophyll-a development increased with hydraulid retention time (RT) up to about 14 days; at RT 14, 71% of the variation in chlorophyll-a was explained by changes in total phosphorus (TP) levels. Chlorophyll-a correlations with dissolved phosphorus (DP) resembled total phosphorus correlations, but were lower in all subpopulations. TP-DP/chl-a ratios were consistent between freshwater and marine communities according to comparisons with other studies. TP is a good approximaton of bioavailable phosphorus. Of nitrogen forms, ammonia-nitrogen (NH) was most strongly correlated with mean chl-a, but (with other dissolved nitrogen forms) was strongest in phosphorus-limited lakes, declined in transitional lakes, and

was very weak in nitrogen-limited lakes. The relationship of pH and alkalinity to chl-a was much stronger in phytoplankton- than macrophyte-dominated lakes. Turbidity and Secchi disc were negatively correlated with chl-a. Stratification had little effect on most parameters except ammonia and nitrite-nitrate-nitrogen. (See also W77-09154) (Lynch-Wisconsin)
W79-02055

P-32 UPTAKE IN LENTIC ALGAE,
Georgia Inst. of Technology, Atlanta. School of Biology.
J. R. Strange, G. D. Williamson, and D. J. Fletcher.
Environmental Letters, Vol. 9, No. 1, p 1-5 1975. 4 fig, 4 ref. OWRT A-035-GA(2), 14-31-0001-3510.

Descriptors: *Algae, Phosphorus radioisotopes, Nostoc, *Absorption, Lakes, Eutrophication, *Georgia, *Lake Sidney Lanier(Geo), *P-32 uptake, Chlorococcum, Fragillaria, Eutropic lakes.

A study of the Flat Creek Embayment of Lake Sidney Lanier near Gainesville, Georgia revealed three genera of algae, Chlorococcum, Fragillaria and Nostoc, to be prominent in this eutrophic region of the lake. The algae were grown in phosphate-rich media and subsequently labelled with P-32. All species incorporated luxury amounts of phosphorus as determined by the uptake of P-32. The results indicate that the P-32 uptake is proportional to the surface-per-volume ratio. The higher surface-per-volume ratio resulted in greater uptake of P-32.
W79-02078

AMINO ACIDS IN SALT MARSH DETRITUS,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
A. A. de la Cruz, and W. E. Poe.
Limnology and Oceanography, Vol. 20, No. 1, p 124-127, January, 1975. 2 tab, 12 ref.

Descriptors: *Amino acids, *Salt marshes, *Detritus, *Marsh plants, Vegetation, Nutrients, Degradation, Decomposing organic matter, Proteins, Nitrogen, Estuaries, Marshes.

Amino acids declined by more than 50% on death of marsh plants, but increased again almost to the level of the living plant during in situ decomposition. A decline in the ratio of total amino acid to crude protein in spite of increases in both amino acids and crude proteins implies nitrogen sources in the marsh other than the amino acids and ammonia in the plants. Suspension feeders may be exposed to food particles of even higher nutrient level than are the grazers on the marsh plants. The analyses support the general observation that estuarine detritus may be a food source of high nutritional value. (Maroncelli-Mass)
W79-02086

PRIMARY PRODUCTION IN A SHALLOW WATER LAKE WITH SPECIAL REFERENCE TO A REED SWAMP,
Odense Univ. (Denmark). Biological Inst.
F. O. Anderson.
Oikos, Vol. 27, No. 2, p 243-250, 1975.

Descriptors: *Primary productivity, *Rooted aquatic plants, Aquatic plants, Phytoplankton, Lakes, Wetlands, *Denmark, Reeds, Eutrophication, Eutrophic lakes.

Phytoplankton gross primary production (C14 method) in the shallow, eutrophic Danish Lake Arreso in 1973 was 980 g C/sq m; calculated net primary production was near zero. Marcophyte net primary production of the reed swamp was measured by harvesting the maximum biomass at three localities dominated by Phragmites or Scirpus. Above ground values were between 420 and 1325 g ash free dry wt/sq m, while below ground values were between 2480 and 8570 g ash free dry wt/sq m. The reed swamps were mapped on aerial photographs, and the composition of the macrophyte vegetation was determined. A comparison of macrophyte vegetation in 1944 and 1972 showed a reduction in species diversity, especially of submerged species. (Stihler-Mass)
W79-02103

APPARENT USE OF SEDIMENT NITROGEN AND PHORPHORUS BY PLANTS IN MALLETTS CREEK MARSH WITH IMPLICATIONS TO LAKE CHAMPLAIN WATER LEVEL REGULATION,
Geological Survey, Albany, NY.
For primary bibliographic entry see Field 2H.
W79-02115

EFFECTS OF SIMULATED FLOODING ON ALLIGATOR EGGS,
Louisiana Wildlife and Fisheries Commissionm, Grand Chenier.
For primary bibliographic entry see Field 2L.
W79-02116

LIMNOLOGY OF SELECTED LAKES IN OHIO - 1975,
Geological Survey, Columbus, OH., Water Resources Div.
For primary bibliographic entry see Field 2H.
W79-02126

WATER QUALITY IN THE OLD PLANTATION WATER CONTROL DISTRICT, BROWARD COUNTY, FLORIDA-PROGRESS REPORT, JULY 1976-JUNE 1977,
Geological Survey, Tallahassee, FL., Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02127

SEDIMENTATION IN HOT CREEK IN VICINITY OF HOT CREEK FISH HATCHERY, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2J.
W79-02128

MACROINVERTEBRATE SAMPLING TECHNIQUES FOR STREAMS IN SEMI-ARID REGIONS: COMPARISON OF THE SURBER METHOD AND A UNIT-EFFORT TRAVELING KICK METHOD,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Systems Research and Development Div.
For primary bibliographic entry see Field 5A.
W79-02146

STORM DERIVED LOSSES OF PHOSPHORUS AND THEIR SIGNIFICANCE TO ANNUAL PHOSPHORUS EXPORT FROM TWO NEW JERSEY WATERSHEDS,
Rutgers - The State Univ., New Brunswick. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W79-02151

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULATIONS IN LAKES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
B. W. Vigon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 683, Price codes: A14 in paper copy, A01 in microfiche. M.S. Thesis, 1976. 290 p, 35 fig, 41 tab, 278 ref, 3 append. OWRT A-061-WIS(2), 14-31-0001-3850, 14-31-0001-5050.

Descriptors: *Silica, *Phosphorus, *Diatoms, *Eutrophication, *Wisconsin, Lakes, *Algal control, *Nuisance algae, Water pollution effects, Water pollution control, *Lake Mendota(Wis).

The role of the vernal diatom population in the removal of P and Si from the lake water was evaluated for Lake Mendota, Madison, Wisconsin in 1974. Measurements were made of total and dissolved reactive P and Si (DRP and DRSi) in the lake water as a function of depth over the period from ice-out (March 3) to the development of thermal stratification (June 3). The amounts of P and Si in the lake water decreased markedly between March 3, and May 1. This time period corresponded to the development and sedimentation of the vernal diatom population. Maximum apparent removals of DRP and DRSi were about 40 and 94%, respectively. Corresponding values for removal of total P and diatom Si were 21 and 72%, respectively. Following sedimentation, mineralization of the diatom population apparently contributed to an increase in the levels of both P and Si in the lake water. Through a combination of field and laboratory measurements, the inputs of Si and P from the drainage basin and the bottom sediments and the losses via outflow were estimated. Using this information and the apparent removal values, the net amounts of P and Si removed by the diatom population were estimated. The net amounts prior to thermal stratification were 62% for DRP and 72% for DRSi. The results show that the vernal diatom population can substantially reduce the amounts of P available to support the growth of nuisance blue-green algae during the summer. (Armstrong-Wis)
W79-02152

THE EFFECTS OF STORM EVENTS ON THE ANNUAL PHOSPHORUS TRANSPORT IN SIX-MILE RUN,
Rutgers - The State Univ., New Brunswick. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W79-02153

EFFECT OF ANTIMYCIN ON STREAM INSECTS IN FIELD AND LABORATORY TRIALS,
Wisconsin Univ.-Madison. Dept. of Entomology.
P. M. Kotila.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 700, Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Thesis, 1978. 107 p. 11 fig, 12 tab, 192 ref, 1 append. OWRT A-073-WIS(1), 14-34-0001-7106, 14-34-0001-8053.

Descriptors: *Fish control agents, *Piscicides, *Aquatic insects, *Invertebrates, *Toxicity, *Antimycin, *Bioassay, Water beetles, Dragon flies, Larvae, Lethal limit, Water pollution effects, Caddisflies, Stoneflies, *Tipula, *Mayflies, Fishfly larvae, Snipefly larvae.

The toxicity of antimycin to 38 species of Wisconsin stream insects was evaluated in static, aerated bioassays utilizing antimycin exposures typical of stream treatments used to kill fish. Several species of Trichoptera, Ephemeroptera and Plecoptera were very sensitive to fish killing concentrations of antimycin (EC-50 less than 50 ppb). Beetles (Psephenus herricki, Optioservus fastiditus, Stenelmis crenata, Helichus striatus, dragonfly nymphs (Neurocordulia molesta, Gomphurus vastus), damselfly nymphs (Argia apicalis), fishfly larvae (Nigronia serricornis), and snipe fly larvae (Atherix variegata) were relatively unaffected by anticmycin (EC-50 greater than 1,000 ppb). Early instars of Tipula spp. and Ephemerella sp. were more sensitive to anticmycin than later instars. Exposure to antimycin produced greater mortality at 19C than at lower temperatures in several species, even though exposure times were reduced at the higher temperature. Post-exposure observations indicated mortality may be delayed more than five days, particularly at reduced temperatures. Large differences in antimycin sensitivity were found for different species belonging to the same family (hydropsychid caddisflies, perlid stoneflies). Emergence of several species of stream insects was reduced or prevented by exposure of the mature larvae or nymphs to sublethal concentrations of antimycin. Pycnopsyche guttifer emerged successfully following exposure of the pupae to an antimy-

cin concentration just below that which killed the larvae. (Hilsenhoff-Wis)
W79-02156

THE CHARACTERIZATION OF BACILLUS CAPABLE OF BLUE-GREEN BACTERICIDAL ACTIVITY,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5D.
W79-02159

PROCEEDINGS OF THE INTERSTATE SEAFOOD SEMINAR OCTOBER 4-7, 1977.
Virginia Polytechnic Inst. and State Univ., Hampton. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5G.
W79-02163

ENVIRONMENTAL IMPACT ASSESSMENT: AN AQUATIC BIOLOGIST'S POINT OF VIEW,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 6G.
W79-02222

SEASONAL FLUCTUATION OF WATER QUALITY (NUTRIENTS AND PIGMENTS) IN LOWER DELAWARE BAY,
Delaware Univ., Lewes. Marine Studies Complex.
D. Maurer, L. Watling, D. Bottom, and A. Pembroke.
Hydrobiologia, Vol. 60, No. 3, p 203-211, 1978. 8 fig, 1 tab, 17 ref.

Descriptors: *Delaware Bay, *Water quality, *Basic data collections, *Seasonal, *Nutrients, *Pigments, *Bays, *Estuaries, Mid-Atlantic Bight, Chlorophyll, Salinity, Water temperature, Dissolved oxygen, Silicates, Nitrates, Nitrites, Orthophosphate, Ammonia, Phaeopigments, Carotenoids, Baseline studies, Marshes, Chesapeake Bay, Raritan Bay,Narrangansett Bay(RI), Long Island Sound,

May 1974-May 1975 baseline data show that the lower Delaware Bay estuary is similar to other estuaries and bays in the mid-Atlantic bight in regard to seasonal fluctuations of nutrients and pigments. The first set of seasonal water quality baseline date for the bay indicates nutrient and pigment concentrations reflect seasonal nutrient patterns in the marshes to a certain degree. All of the estuaries compared, including Delaware, Narrangansett, Raitan, and Chesapeake Bays, and Long Island Sound, had high dissolved oxygen (DO) in winter, and most had undersaturated DO in summer, except Long Island Sound which was high in winter. Pigment concentrations were similar among the estuaries, but seasonal peaks varied. Nitrate, nitrate and inorganic phosphate levels in Delaware Bay were closest to those of Chesapeake Bay. Lower Delaware Bay did not show excess nutrient pollution, based on nitrogen/phosphorus ratios. In Delaware Bay surface and bottom water samples were analyzed for temperature, salinity, DO, silicate, nitrate, and nitrite, orthophosphate, ammonia, chlorophylls-a,-b, and-c, phaeopigments, and carotenoids. Salinity ranged from 22.9-29.7%, and DO from 4.53-8.53 ml/1. Silicate (30.3 micrograms-at/1) and orthophosphate (1.59) were highest in September; ammonia in July (6.8); nitrate and nitrite in January (24.27); February (18.2), and May (16.37); and chlorophyll-a in August (17.2), October (15.7), and March (15.33). (Lynch-Wisconsin)
W79-02223

PHOTOSYNTHETIC RATES OF MARINE ALGAE AS A FUNCTION OF INORGANIC CARBON CONCENTRATION,
Hawaii Inst. of Marine Biology, Honolulu.
J. Caperon, and D. F. Smith.
Limnology and Oceanography, Vol 23, No. 4, p 704-708, July 1978. 2 fig, 1 tab, 14 ref.

Descriptors: *Carbon, *Inorganic compounds, *Photosynthesis, *Marine algae, *Phytoplankton, *Michaelis-Menten equations, *Sea water, Algae, Nutrients, Estuaries, Port Hacking estuary(Australia), Australia, Dinoflagellates, Diatoms, Amphidinium carterae, Chlorella vulgaris, Phaeodactylum tricornutum, Inorganic carbon, Axenic cultures.

The relationship between phytoplankton growth rate in seawater and inorganic carbon concentration is quantatively described for the first time, and applicability of the Michaelis-Menten equation to both single-species and mixed-species marine phytoplankton populations is demonstrated. Inorganic carbon concentrations resulting in half-maximal fixation rates ranged 4.3-5.3 mg C/liter for mixed phytoplankton and 0.8-2.8 for axenic cultures of three algal species. Water samples were collected from the Port Hacking estuary, Australia, May-June 1975 and May 1976, and the plankton concentrated; the latter were composed mainly of diatoms and dinoflagellates. Log phase cultures of Amphidinium carterae, Chlorella vulgaris, and Phaeodactylum were grown in medium f. Algae were added to seawater of varying dissolved organic carbon (DIC) concentrations. The half-saturation constant values (K sub s) obtained imply not only that phytoplankton required 2.8 times the DIC concentration of the axenic algal cultures to reach the half-maximal carbon fixation rate, but the presence of the S sub o term (threshold concentration) indicates that phytoplankton required 0.88 mg C/liter as DIC before net carbon fixation could occur. It is suggested that the apparent distinguishing features of the phytoplankton may be due to the microheterotrophic components of such samples. (Lynch-Wisconsin)
W79-02224

SIMULATION MODEL OF CRYPTOMONAS OVATA POPULATION DYNAMICS IN SOUTHERN KOOTENAY LAKE, BRITISH COLUMBIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. E. Cloern.
Ecological Modelling, Vol. 4, No. 2-3, p 133-149, February, 1978. 12 fig, 27 ref. EPA R-800430.

Descriptors: *Kootenay Lake(B C Canada), *Simulation analysis, *Cryptomonas ovata, *Phytoplankton, *Advection, *Population dynamics, Model studies, British Columbia(Canada), Canada, Lakes, Mathematical models, Algae, Flagellates, Water circulation, Zooplankton, Anabaena, Grazing, Nutrients, Ammonium, Phosphates, Plant growth, Kinetics, Seasonal, Primary productivity, Photosynthesis.

A one-dimensional transient model is developed to simulate observed population dynamics of the small flagellate Cryptomonas ovata in southern Kottenay Lake (British Columbia, Canada) during a one-year period (June 1974-May 1975). The model considers advective displacement of the alga as water flows from the Kootenay River at the southern entrance to the lake and moves toward the sampling sites 11 km north of the river mouth. Specific growth rate is computed from an experimentally determined function of mean irradiance, water temperature, and nutrient concentrations (ammonium and phosphate) in the upper 10 m of the water column. Cell losses are assumed to result from zooplankton grazing and inhibition due to presence of the blue-green alga Anabaena. The model simulates well the timing and magnitude of all observed population changes except for a failure to time the autumn pulse accurately, and gives insight into the important mechanisms which regulate population density of C. ovata in this natural system. Modelling of individual algal species stressing their unique physiological characteristics is important in more precisely simulating overall phytoplankton population dynamics, species composition, and primary productivity. Output of individualized models will be valuable in explaining seasonal succession and secondary productivity. (Lynch-Wisconsin)
W79-02225

WIND INDUCED DISPERSION AND ALGAL GROWTH IN SHALLOW LAKES,
Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W79-02226

A PATTERN ANALYSIS OF CLEAR LAKE PHYTOPLANKTON,
California Univ., Berkeley Lawrence Berkeley Lab.
J. C. Sandusky, and A. J. Horne.
Limnology and Oceanography, Vol. 23, No. 4, p 636-648, July 1978. 1 fig, 6 tab, 44 ref.

Descriptors: *Phytoplankton, *Clear Lake(CA), *Spatial distribution, *Synoptic analysis, *Patchiness, *Statistical models, *Pattern analysis, Algae, California, Lakes, Measurement, Methodology, Analytical techniques, Model studies, Mathematical models, Statistical methods, Dominant organisms, Water chemistry.

Synoptic measurements of phytoplankton distribution in Clear Lake, California, and statistical methods were used to develop a systematic approach for interpreting synoptic surveys in the form of a distribution function. The resulting model was used to analyze water chemistry and phytoplankton data from Clear Lake; 43 sets of data representing 18 freshwater phytoplankton genera yielded reliable results using three fitted parameters per set. Local and regional variability were explicitly separated to avoid overestimating regional variability (patchiness) through counting individual cells of colonial or locally associated species as independent units. patchiness estimates showed significant interspecific variations related to nutrient variability, relative species dominance, and species sensitivity. Pooling cell frequencies for related species reduced patchiness estimates, implying that compaisons of spatial relations between biotic and abiotic parameters underestimate phytoplankton spatial organization when several species are present. In both marine and freshwater systems, phytoplankton patchiness is common and appears to be ecologically significant. Early studies were chiefly qualitative; recent quantitative studies can be categorized according to transect or synoptic sampling strategies. In a synoptic study water samples are collected from many sites over a large area; this method is useful where horizontal variation in more than one direction occurs, or where circulation, topographic, or inflow effects must be considered. (Lynch-Wisconsin)
W79-02227

THE UPTAKE, RETENTION, AND RELEASE OF AMMONIUM BY REEF CORALS,
California Univ., Los Angeles. Dept. of Biology.
L. Muscatine, and C. F. D'Elia.
Limnology and Oceanography, Vol. 23, No. 4, p 725-734, July 1978. 8 fig, 1 tab, 35 ref. NSF L.M. (PCM 74-91874).

Descriptors: *Ammonium, *Symbiosis, *Coral, *Zooxanthellae, *Nitrogen, *Essential nutrients, Nutrients, Pacific Ocean, Reefs, Michaelis-Menten equations, Diffusion, Oceans, Absorption, Light, Photoperiodism, Kinetics, Nutrient budgets, Darkness, Algae, Recycling, Cycling nutrients, Photosynthesis, Retention, Pocillopora, Tubastrea aurea, Porites lutea.

A study of ammonium flux in Pacific reef corals (as part of construction of a nitrogen budget) showed that of three coral genera tested, only those symbiotic with zooxanthellae (chrysophyte algae) take up and retain ammonium. Uptake and retention were enhanced by light, and the normal daylight period was sufficient to sustain ammonium retention during the night for at least one coral (Pocillopora capitata). The effect of light was undoubtedly a function of zooxanthellar photosynthesis. Ammonium uptake kinetics for three species indicated that a two-process mechanism may be involved. With a correction for diffusion, uptake kinetics can be characterized by the Michaelis-Menten equation: V=(V sub max S)/(K sub s + S). The symbiotic corals seem generally well-adapted to

cope with a paucity of environmental nitrogen, retaining virtually all of the animal excretory ammonium and having the ability to scavenge ammonium from the environment. By preventing ammonium loss during night as well as day, and as a result of the translocation of combined nitrogen from algae to host, the coral-algal complex may recycle some combined nitrogen, which would help it to tolerate an environmental deficiency. Specimens were collected at Hawaii, Enewetak (northern Marshall Islands), Clarion Island (eastern Pacific), and the Great Barrier Reef (Australia). Species included Pocillopora damicornis, P. meandrina, P. capitata, Tubastrea aurea, and Porites lutea. (Lynch-Wisconsin)
W79-02228

RELATIONSHIPS AMONG SUBSTRATE, FLOW, AND BENTHIC MICROALGAL PIGMENT DENSITY IN THE MECHUMS RIVER, VIRGINIA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
P. Tett, C. Gallegos, M. G. Kelly, G. M. Hornberger, and B. J. Cosby.
Limnology and Oceanography, Vol. 23, No. 4, p 785-797, July 1978. 6 fig, 3 tab, 24 ref. NSF GB 32914.

Descriptors: *Mechums River(VA), *Pigments, *Substrates, *Streamflow, *Periphyton, *Biomass, Rivers, Virginia, Algae, Photosynthesis, Chlorophyll, Measurement, Estimating, Benthic flora, Microalgae, Spatial distribution, Current(Water), Patchiness, Sediments, Plant growth, Floods, Scour, Nutrients.

High streamflow due to unpredictable and heavy rainfall was the main factor controlling periphyton biomass in the Mechums River, a small river in the Virginia Piedmont; deterministic predictions of algal crop are therefore not possible in rivers of this type. Periphyton biomass was estimated on soft and hard substrates using measurements of photosynthetic pigments, which provided a faster method of quantifying the microalgae than direct estimation of algal numbers. The irregular distribution of periphyton was partially related to substrate distribution and is explained as a result of spatial variations in the current regime in the river. Results indicate a complex relationship between current velocity, prior flow regime, substrate type, and pigment density. Although nutrient levels probably control maximum biomass, the amount of variation in the chlorophyll density of samples from the same part of the river shows that nutrients do not play a major role in determining biomass at any particular point. The flow regime, which controls actual biomass, also determines the type of sediment. Likewise, although light and water temperature must influence periphyton growth rate, such effects are masked by the catastrophic effects of floods, which are more frequent in winter due to the reduced capacity of the soil to absorb participation. Effects of washout and scour become crucial during floods. (Lynch-Wisconsin)
W79-02229

THE DISTRIBUTION AND FORM OF PHOSPHORUS IN NORTH ATLANTIC OCEAN DEEP-SEA AND CONTINENTAL SLOPE SEDIMENTS,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 5B.
W79-02230

THE COLONIZATION OF CABORA BASSA, MOCAMBIQUE, A NEW MAN-MADE LAKE, BY FLOATING AQUATIC MACROPHYTES,
Loxton, Hunting and Associates, Gaberone (Botswana).
For primary bibliographic entry see Field 4A.
W79-02231

SEASONAL CHANGES IN THE EPIPHYTE COMMUNITY OF NATURAL AND ARTIFICIAL MACROPHYTES IN LAKE MEMPHREMAGOG (QUE. AND VT.),
McGill Univ. (Montreal). Dept. of Biology.
A. Cattaneo, and J. Kalff.
Hydrobiologia, Vol. 60, No. 2, p 135-144, 1978. 9 fig, 2 tab, 28 ref.

Descriptors: *Seasonal, *Epiphytes, *Artificial substrates, *Potamogeton richardsonii, *Macrophytes, *Lake Memphremagog(VT Quebec), *Canada, Vermont, Quebec(Canada), Lakes, Substrates, Biological communities, Biomass, Chlorophyll, Species composition, Bays, Shallow water, Phytoplankton, Algae, Succession, Ecology, Calcium carbonate, Sessile algae, Species diversity, Leaves.

Seasonal changes in epiphyte biomass (measured as chlorophyll-a and cell volume) and species composition were compared on Potamogeton richardsonii and on a similar plastic plant in a shallow bay of Lake Memphremagog in Vermont and Quebec, Canada. Community development and diversity were both higher on the natural plant, apparently the result of summer accumulation of calcium carbonate observed only on the upper leaf surfaces of the natural plants. Precipitation of calcium carbonate by P. richarsonii constitutes its main effect on epiphyte development; there is no evidence for either direct inhibition or stimulation of epiphytes by the natural plants. Reduced epiphyte biomass on growing tips is attributable to an insufficient time for colonization rather than to inhibition by the macrophyte. Both the natural and artificial substrates exhibited two periods of high biomass during the June-September (1975) growing season: (1) in June, when the community was dominated by loosely attached species with a strong phytoplanktonic component (up to 37%), and (2) in September, when epiphytes were characterized by species tightly attached to the leaves. During both periods communities were better developed on the natural plants. Pairs of natural and artificial plants were planted at depths of 40-90 cm, and harvested randomly (generally weekly); 108 algal species were identified among the epiphytes: 90 species of Chrysophyta, 13 species of Chlorophyta, and five species of Cyanophyta. (Lynch-Wisconsin)
W79-02232

RELEASE OF DISSOLVED ORGANIC CARBON BY GRAZING ZOOPLANKTON,
Frankfurt Univ. (West Germany). Fachbereich Biologie.
W. Lampert.
Limnology and Oceanography, Vol. 24, No. 3, p 831-834, July 1978. 2 tab, 12 ref.

Descriptors: *Dissolved organic carbon, *Daphnia pulex, *Grazing, *Phytoplankton, *Zooplankton, Carbon, Organic matter, Particulate organic carbon, Cladocera, Algae, Carbon radioisotopes, Tracers, Lakes, Asterionella formosa, Stichococcus minutissimus, Stephanodiscus hantzschii, Nitzschia actinastroides, Cryptomonas ovata, Scenedesmus acutus, Secretion, Feces.

A conclusion that the cladoceran Daphnia pulex releases significant dissolved organic carbon (DOC) while feeding on six phytoplankton species found in freshwater lakes contradicts Wetzel's assumption that DOC excretion by zooplankton and higher animals is quantitatively negligible. The algal species were labelled with carbon-14 in the tests, designed to determine: (1) the amount of DOC released during ingestion, (2) DOC released by Daphnia secretion, (3) DOC released via leaching from Daphnia feses, and (4) the extent to which DOC release is dependent upon the algal food species. Up to 17% of the algal carbon was initially lost as DOC because of breakage of the diatoms Stephanodiscus hantzschii and Asterionella formosa and the relatively large flagellate Crytomonas ovata, while only 4% of carbon was lost from the other three species, which were swallowed whole. The latter species was the chlorophytes Scenedesmus acutus and Stichococcus minutissimus and the diatom Nitzschia actinastroides. Additional DOC was produced through Daphnia secretion and by leaching from feces. A total of 10-17% of the algal particulate organic carbon consumed by the daphnoids was transformed to DOC for all species except Stichoccus which was negligible. During periods when phytoplankton primary production is totally consumed by zooplankton, more than 10% of carbon fixed in photosynthesis is approximately added to the DOC pool through grazing zooplankton. (Lynch-Wisconsin)
W79-02234

NUTRIENT AND PARTICULATE FLUXES IN A SALT MARSH ECOSYSTEM: TIDAL EXCHANGES AND INPUTS BY PRECIPITATION AND GROUNDWATER,
Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.
I. Valiela, J. M. Volkmann, D. Shafer, and E. J. Carpenter.
Limnology and Oceanography, Vol. 23, No. 4, p 798-812, July 1978. 9 fig, 7 tab, 40 ref. NSF GA-43008,GA-43009.

Descriptors: *Nutrient flux, *Particulates, *Salt marshes, *Great Sippewissett Marsh(MA), *Nitrogen, *Organic matter, Nutrient budgets, Limiting factors, Massachusetts, Nutrients, Ecosystems, Spartina alterniflora, Ammonium, Phosphates, Nitrates, Nitrites, Marsh plants, Groundwater, Rain, Carbon, Phosphorus, Import, Export, Precipitation(Atmospheric), Tidal effects, Tidal marshes.

Budgets of nitrogen species and particulate organic matter in Great Sippewissett Marsh, a tidal salt marsh at Falmouth, Massachusetts, by rain, flow of fresh groundwater, and the tidal exchanges were studied. Although it is generally believed that salt marshes export organic materials, the nature and extent of exchange between marshes and coastal waters has not been well understood. This study shows that during summer, uptake by marsh biota leads to net nutrient import, but there is a net annual export of ammonium, nitrate, nitrite, dissolved organic nitrogen (DON), particulate nitrogen (PN), particulate carbon (PC), and phosphate. Increased ammonium export in August may be due to leaching from senescent marsh plants. Major nitrogen forms exported are ammonium, DON, and PN, and exports may contribute substantially to coastal water nutrient supplies. Groundwater, which brings in over 20 times more nutrients than rain, primarily imports nitrate-nitrogen and DON, while precipitation mainly provides DON, nitrate-nitrogen, and ammonium-nitrogen. Particulate materials in rain have a high cargon: nitrogen ration, and contribute little to enrichment of the nitrogen-limited salt marsh. About half the dissolved inorganic nitrogen brought in by groundwater is exported as PN, thus transforming nitrogen usable by primary producers into a form suitable for such consumers as shellfish. PC exported amounts to 40% of the net annual production of Spartina alterniflora, the dominant marsh plant. (Lynch-Wisconsin)
W79-02235

DEPENDENCE OF LIGHT-SATURATED RATES OF ALGAL PHOTOSYNTHESIS ON INTRACELLULAR CONCENTRATIONS OF PHOSPHORUS,
Minnesota Univ., Minneapolis. Dept. of Ecology and Behavorial Biology.
W. H. Senft.
Limnology and Oceanography, Vol. 23, No. 4, p 709-718, July 1978. 9 fig, 42 ref. ERDA E(11-1)-1820.

Descriptors: *Phosphorus, *Phytoplankton, *Photosynthesis, *Cell quota, *Light, *Plant growth, Chlorophyll, Intracellular nutrient concentration, Model studies, Mathematical models, Nutrients, Cyanophyta, Chlorophyta, Algae, Chlorella pyrenoidosa, Anabaena wisconsinese.

Specific photosynthetic rates of laboratory populations of a cyanophyte (Anabaena cf, wisconsinense) and a chlorophyte (Chlorella pyrenoidosa) at saturating irradiances were dependent on intracellular phosphorus(Q). A hyperbolic model of the form P sub opt=P sub opt=P sub opt-s (1-K sub Q/Q) was used to describe this relationship for

three measures of biomass: cell number, cell volume, and chlorophyll-a. The latter best dit the model. When chlorophyll-a was used as the measure of population size, both the maximal specific rate of photosynthesis (P sub opt-s) and the subsistence cell quota (K sub Q) for Anabaena were much large than for Chlorella. The dramatic differences in the responses of Anabaena and Chlorella to a fixed level of cellular phosphorus suggest that each species may have a characteristic P sub op-s and K sub Q calue, but whether this difference is characteristic of cyanophytes and chlorophytes in general is not known. Data presented here clearly indicate that the photosynthetic efficiency of a chlorophyll unit is not constant, but instead varies with the nutritional state of the algal population. The relationship between photosynthesis and intracellular nutrients is important because the dependence of growth rates on Q observed in laboratory populations probably reflects a more fundamental dependence of photosynthesis on the intracellular nutrients.
W79-02236

KINETICS OF ALGAL TRANSIENT PHOSPHATE UPTAKE AND THE CELL QUOTA CONCEPT,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
E. J. Brown, and R. F. Harris.
Limnology and Oceanography, Vol. 23, No. 1, p 35-40, January 1978. 4 fig, 1 tab, 21 ref. NSF AG-199, BMS76-00761193-69.

Descriptors: *Kinetics, *Absorption, *Phosphates, *Nutrients, *Cell quota, *Phytoplankton, Transient nutrient uptake, Algae, Selenastrum capricornutum, Nostoc, Bacteria, Orthophosphate, Inorganic compounds, Mathematical studies, Limiting factors, Plant growth, Microorganisms.

Dissolved inorganic orthophosphate (P sub i) uptake rates (v) were determined as a function of total cell phosphorous content (Q) in P sub i - perturbed axenic batch cultures of the green alga Selenastrum capricornutum and the blue-green bacterium Nostoc sp. Results showed an inverse relationship between v and Q for both organisms. The findings help relate the cell quota concept of nutrient-limited, steady-state microbial growth kinetics to nutrient uptake kinetics observed in perturbed batch cultures. Continuous-culture growth experiments have shown that one metabolic indicator of microbial growth-rate (mu) may be the cell quota (Q) -- the nutrient content of the organism. Cell quota has also been shown to control transient nutrient uptake rates, at least for growth-limiting nutrients. Low external limiting nutrients concentrations (S), resulting from aquatic microbial uptake, complicates interpretation of the kinetics of transient uptake, and steady-state growth, and has led to complex mathematical relationships among mu, S, and Q. Other factors are maximum growth rate constant (mu sub max), minimum cell nutrient content (k sub Q), maximum nutrient uptake rate constant (V), and half-saturation constants for growth (K sub mu) and uptake (K sub v). The cell quota concept is currently useful for relating microbial growth rate to changes in moderate to high levels of inorganic nutrients that are growth-rate limiting, but it is only an approximation. (Lynch-Wisconsin)
W79-02237

USE OF FLUORESCENCE MICROSCOPY FOR QUANTIFYING PHYTOPLANKTON, ESPECIALLY FILAMENTOUS BLUE-GREEN ALGAE,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
T. D. Brock.
Limnology and Oceanography, Vol. 23, No. 1, p 158-160, January 1978. 4 fig, 5 ref. NSF DEB77-03906 and ERD COO-2161-35.

Descriptors: *Phytoplankton, *Filamentous algae, *Fluorescence, *Microscopy, Measurement, *Methodology, Staining, Cyanophyta, Bacteria, Lake Mendota(WI), Wisconsin, Lakes, Eutrophication, Research equipment, Algae, Primuline stain, Fluorochromes, Filtration.

Epifluorescence after fluorochrome staining provides a simple and direct means of making phytoplankton on filters, visible, after which they can be quantified using various techniques. Water samples from Lake Mendota (Madison Wisconsin) were stained with fluorochrome primuline yellow (C.I. 49000) and filtered on black membrane filters. The phytoplankton were viewed under wet mount at high magnification (about 300-500x). for filamentous blue-green algae (for which the method is especially useful), Olson's procedure number five was used to make quantitative estimates of filament lengths, in turn used with measurements of diameter to calculate volume of the algae. Olson's procedure consists of: (1) fitting a measuring eyepiece with an ocular grid, (2) counting the number of crosses the filaments make with the grid's horizontal and vertical lines, (3) multiplying the number of crosses by pi/4 (0.786) to yield aggregate lengths of filaments per unit volume of water. Filament volume is then calculated using filament diameter. Samples were stirred prior to filtration to ensure homogeneous settling. The epifluorescence technique not only permits rapid counting with large volumes of water, but does not require an inverted microscope (though a fluorescence attachment is necessary). Bacteria can also be counted with use of a 100x objective. (Lynch-Wisconsin)
W79-02239

SOFT-SHORE MACROBENTHOS ALONG THE SOUTH-WEST COAST OF WALES,
University Coll. of Swansea (Wales). Dept. of Zoology.
R. G. Withers.
Estuarine and Coastal Marine Science, Vol. 5, No. 4, p 467-484, 1977. 1 fig, 2 tab, 51 ref, 3 append.

Descriptors: *Benthis fauna, *Spatial distribution, *Biomass, *Wales, *Beaches, *Intertidal areas, Crustaceans, Polychaetes, Arenicola marina, Cardium edule, Macrobenthos, Shores, Littoral, Milford Haven(United Kingdom), Gower Peninsula(Wales), Carmarthen Bay(Wales), United Kingdom, Distribution, Abundance.

Distribution, zonation and abundance of sand-dwelling fauna was investigated at 15 coastal beach sites between Milford Haven and Swansea Bay in southwestern Wales, United Kingdom. On the basis of geological characteristics and macrofaunal composition the area under study was divided into three regions: (1) Milford haven and the Angle Peninsula; 82) Carmarthen Bay; (3) South Gower and the Swansea Bay. At Milford Haven and the Angle Peninsula sediments consisted mainly of gravel overlain by a thin veneer of silty sand. Such places were colonized by small crustaceans and polychaetes. Where sand was deeper large populations of Arenicola marina and Cardium edule were found. In deep, medium and fine sands of the Carmarthen Bay area species of crustaceans and polychaetes were more varied. Molluscs and the echinoid Echinocardium cordatum were common. South Gower beaches contained well-sorted, medium or fine sand. Where beaches were well sheltered relatively large and diverse macrofauna was present, including bivalves and echinderms. The latter two were not present at the exposed beaches. Sediments at Swansea Bay ranged from clayey, black mud to coarse sand. Each sediment type supported its own characteristic macrofauna with the polychaete Lanice conchilega particularly abundant on the lower shore. Mean biomass levels for each of the regions ranged 0.25 - 13.7 g dry weight/sq m. Higher values were a result of abundance of one or two larger species. (Harris-Wisconsin)
W79-02240

BIOACCUMULATION POTENTIAL AND ACUTE TOXICITY OF SYNTHETIC FUELS EFFLUENTS IN FRESHWATER BIOTA: AZAARENES,
Oak Ridge National Lab., TN.
G. R. Southworth, J. J. Beauchamp, and P. K. Schmieder.
Environmental Science and Technology, Vol. 12, No. 9, p 1062-1066, September 1978. 3 fig, 1 tab, 25 ref. W-7405-eng-26.

Descriptors: *Azaarenes, *Toxicity, *Bioaccumulation, *Fuels, *Daphnia pulex, *Public health, *Carcinogens, *Human diseases, Isoquinoline, Acridine, Benz(a)acridine, Pollutants, Water pollution effects, Lethal limit, Effluents, Zooplankton, Kinetics, Equilibrium, Model studies, Mathematical studies, Mutagens.

Three polycyclic aromatic bases (isoquinoline, acridine, and benz(a)acridine), contained in coal-based synthetic liquid fuels, were concentrated from aqueous solutin by Daphnia pulex about 350-, 30-, and 2.5-fold, respectively. These substances containing a single basic nitrogen within two, three, four, or more aromatic ring systems (azaarenes) belong to a class of compounds which includes known mutagens and carcinogens. Data in this study established that bioaccumulation data were not collected at acutely toxic concentrations, and also indicated that toxicity of these compounds is determined more by differences in delivery of the various toxicants to the organisms than by variation of toxic action within the animal. All data indicate that releases of azaarenes to aquatic ecosystems must be minimized. Bioaccumulation kinetics were described as a first-order approach to equilibrium in a two-compartment model (water and Daphnia) using a two-stage technique to resolve uptake and elimination rates while accounting for decreasing aqueous concentrations. Equilibrium concentration factors increased dramatically with increasing molecular weights within the series of compounds and were also highly correlated with the calculated n-octanol/water partition coefficient. Acute toxicity exhibited the same relationship with changing molecular weight, with 24-hr LC50s of 0.4, 2.9, and 39.9 mg/liter for the three compounds. (Lynch-Wisconsin)
W79-02241

POLYCHLORINATED BIPHENYLS IN COASTAL MARINE ZOOPLANKTON: BIOACCUMULATION BY EQUILIBRIUM PARTITIONING,
Washington Univ., Seattle. Dept. of Oceanography.
J. R. Clayton, and N. F. Breitner.
Environmental Science and Technology, Vol 11, No 7, p 676-682, 1977. 5 fig, 8 tab, 43 ref.

Descriptors: *Polychlorinated biphenyls, *Zooplankton, *Puget Sound(WA), *Estuaries, *Bioaccumulation, Equilibrium partitioning, *Marine microorganisms, Water pollution sources, Path of pollutants, Estuarine environments, Dredging, Municipal wasters, Runoff, Bays, Gulfs, Food chains, Lipids, Trophic level.

Zooplankton samples from Puget Sound, Washington were studied 1973-1975 to learn about factors that control bioaccumulation of chlorobiphenyls (CB) in lower trophic levels of nearshore ecosystems. Analysis of the data suggest that: (1) lipid-water concentration ratios for CB are constant over a range of spatial and temporal regimes; (2) the residue levels in ambient water and in zooplankton normalized to lipid is important in controlling the degree of accumulation, particularly when lipid constitutes more than 2% of zooplankton fresh weight; (3) lipid-water concentrations for CB are independent of changes in faunal composition; (4) the total reservoir of CB in the water is higher than that in the biota. Results of this study confirm that zooplankton are exposed to CB water concentrations for a period of time sufficiently long to establish equilibrium and that biota possess surface properties favoring establishment of rapid exchange between the internal lipid pools and the water medium. The type of bioaccumulation mechanism observed for CB are also relevant to the spatial and temporal distributions of other environmentally stable toxic organic chemicals in aquatic ecosystems and should be accounted for in environmental impact studies. (Harris-Wisconsin)
W79-02242

INTERSTITAL WATER CHEMISTRY OF ANOXIC LONG ISLAND SOUND SEDIMENTS. 2. NUTRIENT REGENERATION AND PHOSPHATE REMOVAL,

Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
C. S. Martens, R. A. Berner, and J. K. Rosenfeld.
Limnology and Oceanography, Vol. 23, No. 4, p 605-617, July 1978. 7 fig, 7 tab, 46 ref.

Descriptors: *Nutrient removal, *Phosphates, *Sediments, *Long Island Sound, *Interstices, *Water chemistry, Stoichiometry, Nutrients, Nutrient regeneration, Sulfates, Ammonia, Nitrogen, Phosphorus, Diffusion, Adsorption, Vivianite, Struvite, Chemical precipitation, Mineralization, Ions, Anaerobic conditions.

Nutrient regeneration chemistry in anoxic Long Island Sound sediments was examined through changes in the concentration of dissolved sulfate, ammonia, reactive phosphate, and other chemical species with depth in interstitial waters. In offshore sediments the ratio of mean changes in dissolved sulfate, dissolved ammonia, and dissolved reactive phosphate was -53:4.6:0.37; in shallow harbor sediment the ratio was -53:19:3.3 and changes in ammonia and reactive phosphate ratios were half the offshore ratio. These apparent shoreward changes reflect more rapid deposition and therefore either less preferential stripping of phosphorus and nitrogen from organic material before burial in shallow water harbor sediments, or selective stripping in the heavily bioturbated upper sediment layers offshore, or both. Effects of differential diffusion and adsorption of ammonia and phosphorus are considered. Phosphate concentration maxima in ammonia-and phosphate-rich shallow harbor sediments yield evidence for possible equilibrium with respect to vivianite and struvite. Phosphate removal at depth at two of the coring sites was probably caused by authigenic mineral formation. The three sites in Long Island Sound were chosen to represent sedimentary environments with a range of dissolved sulfate distributions; water depths (mean low tide) were about 7.0, 2.0, and 1.5 m, at the stations. (See also W77-06900) (Lynch-Wisconsin)
W79-02243

BLOOMS OF SURF-ZONE DIATOMS ALONG THE COAST OF THE OLYMPIC PENINSULA, WASHINGTON, IX. FACTORS CONTROLLING THE SEASONAL CYCLE OF NITRATE IN THE SURF AT COPALIS BEACH (1971 THROUGH 1975),
Washington Univ., Seattle. Dept. of Oceanography.
J. Lewin.
Estuarine and Coastal Marine Science, Vol. 7, No. 2, p 173-183, August 1978. 8 fig, 2 tab, 15 ref.

Descriptors: *Diatoms, *Copalis Beach(WA), *Surf, *Eutrophication, *Nitrates, *Limiting factors, Nutrients, Cycling nutrients, Washington, Olympic Peninsula(WA), Surf diatoms, Beaches, Algae, Phytoplankton, Upwelling, Ammonia, Thalassiosira pacifica, Asterionella socialis, Chaetoceros armatum, Nearshore zone, Winds, Discharge(Water), Rivers, Salinity, Seasonal, Pacific Ocean, Oceans, Surface waters, Nitrogen cycle.

Investigation of the seasonal nitrate cycle at Copalis Beach, Olympic Peninsula, Washington, in 1971-75 showed that: (1) annual nitrate depletion in April in upper waters beyond the breaker zone and in the surf zone is due to spring phytoplankton blooms; (2) reintroduction of nitrate into the surf region mid-April to mid-October depends on encroachment of nitrate-rich upwelled oceanic deep water; (3) upwelling can be masked by freshwater stream and river discharge; (4) seasonal species abundance cycles were repeated annually and did not depend on varying nitrate concentrations; and (5) ammonia is an important alternate nitrogen source for surf diatoms, particularly during summer. Water samples were collected from the surf zone and from beyond the breakers triweekly for 24 hrs (sampling every three hrs), and salinity and temperature were measured. 1971 was characterized by greatly reduced coastal upwelling, and 1973 by record low rates of freshwater discharge from coastal rivers. During 1971 nitrate in the surf remained depleted over an extended period (six months), and in 1973 nitrate concentrations in summer surf samples were the highest of the study. In 1974 Thalassiosira pacifica was responsible for almost all the nitrate depletion beyond the breakers. During all summers, cell concentrations of both surf diatom species were reduced, with Asterionella socialis disappearing completely, and Chaetoceros armatum exhibiting physiological stress. (Lynch-Wisconsin)
W79-02244

A BUDGET OF NITROGEN RECYCLING IN NORTH SEA SEDIMENTS OFF THE BELGIAN COAST,
Brussels Univ. (Belgium). Lab. d'Environnement.
G. Billen.
Estuarine and Coastal Marine Science, Vol. 7, No. 2, p 127-146, August 1978. 11 fig, 8 tab, 45 ref.

Descriptors: *North Sea, *Sediments, *Nutrient budgets, *Nitrogen cycle, *Cycling nutrients, *Methodology, Measurement, Belgium, Coasts, Offshore zone, Nearshore zone, Mathematical models, Model studies, Ammonium, Nitrates, Nutrients, Benthic fauna, Benthos, Nitrogen fixing bacteria, Denitrification, Nitrification, Recycling, Interstices, Seas, Sediment-water interfaces, Simulation analysis.

A new method of determining nutrient flux across the sediment-water interface was used to evaluate nitrogen recycling in sediments of the Southern Bight of the North Sea off the Belgium coast. The method is a simplified diagenetic model which uses: (1) vertical profiles of ammonium and nitrate concentrations measured in interstitial water of the sediments, plus (2) direct measurements of ammonification, nitrification, and denitrification rates in the same sediment samples. The model, which simulates the concentration profile in the interstitial water, permits evaluation of ammonium and nitrate fluxes across the sediment-water interface. Such fluxes are important in the whole nitrogen cycle of the ecosystem. Fluxes of ammonium and nitrate from sediments to the water column account for an estimated 62-105% of primary producer requirements in the North Sea coastal zone, and 30-52% in the offshore zone, indicating an important part of nutrient recycling occurs in the benthic phase rather than in the water column, particularly in the coastal zone. Cores for this study were collected 1974-76 in PVC core-liner tubes 30 cm long and seven cm in diameter. Only this manual method left the sediment surface undisturbed. Existing methods for determining nutrient flux have not always been satisfactory, and the importance of recycling of biogenic elements in sediments has often been underestimated. (Lynch-Wisconsin)
W79-02245

SPECIFIC BLUE-GREEN ALGAL CAROTENOIDS IN SEDIMENTS OF ESTHWAITE WATER,
Washington Univ., Seattle. Dept. of Zoology.
M. Griffiths.
Limnology and Oceanography, Vol 23, No. 4, p 777-784, 1978. 3 fig, 18 ref.

Descriptors: *Esthwaite Water(United Kingdom), *Cyanophyta, *Carotenoids, *Myxoxanthophyll, *Oscillaxanthin, *Pigments, *Eutrophication, Lakes, Bioindicators, England, Algae, Sediments, Cores, Oscillatoria, Sedimentation, Nutrients, Water pollution effects, Dating, Age, Fertilizers, Tourism, Water pollution sources.

Comparison of sediment cores and cyanophyte records in 1948-75 for moderately eutrophic Esthwaite Water in the English Lake District permitted correlation of algae in the lake with their pigments in recent sediments. Core profiles of such pigments can indicate appearance of cyanophytes in a lake, and can therefore indirectly predict the onset of eutrophication. The pigment oscillaxanthin is found primarily in some species of Oscillatoria. Myxoxanthophyll is generally considered characteristic of cyanophytes. Two cores five cm in diameter and one m long were taken in the lake's deepest part (13.5-15.0 m deep). Myxoxanthophyll profiles in the two cores showed maxima at 6-7 cm and 14-16 cm and low values in the top five cm and below 17-19 cm. Oscillaxanthin profiles followed a similar pattern, but without the pronounced maxima. Correlation of maximal algal counts in lake water with depths of myxoxanthophyll sediment maxima yielded an annual sedimentation rate of the top 15 cm of 0.6 cm/yr, which agrees well with other methods. Sediment dating with 210Pb gave 1885 for 40 cm. Core profiles suggest that cyanophyte populations were negligible before 1885, increased slowly 1885-1945, and then increased steeply from 1945 to the known maxima of 1948-49 which coincides with tourist influx and increased fertilizer use. Low cyanophyte levels in the last five years may indicate that eutrophication has advanced to where groups other than cyanophytes have become dominant. (Lynch-Wisconsin)
W79-02246

AN EVALUATION OF PHOSPHORUS-CHLOROPHYLL-PHYTOPLANKTON RELATIONSHIPS OF LAKES,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
K. H. Nicholls, and P. J. Dillon.
Internationale Revue der Gesamten Hydrobiologie, Vol 63, No 2, 1978. p 141-154. 6 fig, 3 tab, 54 ref.

Descriptors: *Lakes *Phytoplankton, *Phosphorus, *Chlorophyll, *Trophic level, *Eutrophication, *Estimating equations, *Analytical techniques, *Measurement, Nutrients, Algae, Methodology, Model studies, Mathematical studies, *Reviews, Forecasting, Seasonal, Stratification, Solar radiation, Cell volume, Biomass, Estimating, Carbon, Calories.

Comparison of several phosphorus-chlorophyll-phytoplankton relationships in recent literature reveals considerable variation, only some of which can be attributed to variation in sampling and analytical techniques. Even under consistent sampling and analysis, significant inherent variability in phosphorus-chlorophyll relationships has been documented; cellular algal chlorophyll content ranges over two orders of magnitude (0.1-9.7% of fresh weight). It is concluded that direct microscopic determination is the best estimation for phytoplankton biomass; for studies requiring only an average biomass value for lake trophic state categorization, analysis of a single combined sample is suggested. Carbon and caloric content relate much better than pigment content to algal biomass, but measurements of carbon and calories in lake water usually includes detritus and animals. In a group of interconnected Ontario lakes it is shown that relationships between average total phosphorus and phytoplankton biomass are much better defined if summer average cell volume is used instead of summer average chlorophyll-a. Chlorophyll content of algal cells seems primarily controlled by four factors: (1) average daily incident radiation intensity, (2) species composition, (3) nutrient availability (especially nitrogen), and (4) innate physiology. Total phosphorus may not be the best universal measure of available phosphorus, but refinement would involve rather sophisticated bioassay techniques. (Lynch-Wisconsin)
W79-02247

THE UPTAKE OF DISSOLVED ORGANIC MATTER BY A SMALL SPRING STREAM,
Waterloo Univ. (Ontario). Dept. of Biology.
D. L. Lush, and H. B. N. Hynes.
Hydrobiologia, Vol. 60, No. 3, September 1978, p 271-275. 3 fig, 1 tab, 9 ref.

Descriptors: *Streams, *Organic matter, *Leaves, *Leachate, *Dissolved solids, *Self-purification, *Absorption, *Adsorption, Spring waters, Ouse River(Ontario Canada), Canada, Maple trees, White cedar trees, Acer saccarum, Thuja occidentalis, Tracers, Sodium chloride.

Leachates of dead leaves from sugar maple (Alcer saccharum) and eastern white cedar (Thuja occidentalis) were added to a tiny spring-fed headwater of the Ouse River, Ontario, Canada; sampling

at three weirs showed organic matter was removed from solution at remarkedly high rates (0.5-1.1 g/sq m/hr). Data suggest chemical uptake (possibly by adsorption) was responsible for most of the initial removal, with absorption occurring secondarily. The stream rises from a spring boil at the edge of a small pool and flows through a small channel over a substratum of cobbles, fine sand, clay, organic debris, and old logs and branches. The hard water (200 mg/l total hardness) had a pH of 7.8. Background sodium was one mg/l and dissolved organic carbon two mg/l. Three small weirs were installed at 10-11 m intervals to permit sampling and measurement of flow rate. About 12 g of auto-claved leaf leachate with a sodium chloride tracer were added to the pool above the weir one and samples were collected at each weir every 10-15 min for at least 90 min. While the sodium was persistent, 36-86% of the organic matter was lost during the 30 min trip to weir no. three in the first three experiments (October-December 1972). In the fourth experiment, conducted in April 1973 after spring runoff, there was not measurable reduction in organic matter, but leachate had been held for five days at 10C before use and had lost most of its dissolved material. (Lynch-Wisconsin)
W79-02248

MAXIMUM DEPTH INHABITED BY AQUATIC VASCULAR PLANTS,
Rensselaer Polytechnic Inst. Troy, NY. Dept. of Biology.
R. B. Sheldon, and C. W. Boylen.
The American Midland Naturalist, Vol 97, No 1, January 1977, p 248-254, 2 fig, 1 tab, 20 ref.

Descriptors: *Depth, *Lake George(NY), *Rooted aquatic plants, *Light penetration, *Submerged plants, *Transparency, *Oligotrophy, Secchi disc, Macrophytes, Algae, New York, Lakes, Turbidity, Light intensity, Potamogeton, Myriophyllum, Isoetes, Elodea canadensis, Elatine minima, Eriocaulon septangulare, Najas flexilis, Utricularia resupinata, Vallisneria americana, Eutrophication, Nutrients.

Maximum and preferred depth distributions of 28 submerged rooted vascular aquatic plants were studied by divers in oligotrophic Lake George, New York; maximum depth for several species is greater than previously reported. Greatest depth for any one species is 12 m for Elodea canadensis, followed by 10 m for Potamogeton robbinsii, and nine m for P. pusillus, Isoetes macrospora, and Najas flexilis. In most freshwater ecosystems vascular plants are reported limited to less than five m depth, and the previous maximum reported was 10 m in a few lakes. Lake George has exceptionally high water clarity but nutrients are sufficient to support relatively abundant vascular plant growth without encouraging phytoplakton productivity to the extent of reducing availability of light at 10-12 m. Observations were made June 1973- August 1975 at random sites on the periphery of the lake, which is 51 km long by about 2.3 km wide, with a 60 m maximum depth. Water clairty is sufficient to allow 10% of surface light intensity during midsummer to penetrate to 12 m. Secchi disc readings are commonly 6 - 7 m with values as high as 13.5 m recorded. The number of submergent species drops linearly from 38 at one m to one at 12 m. Although it has been stated that hydrophytes may colonize substrates to a depth receiving only 1-4% of surface light intensity, in Lake George depths receiving more than 1% exceed 18 m, while the limit of plant growth is 15 m (the microalga Nitella flexilis). (Lynch-Wisconsin)
W79-02249

RECENT CHANGES IN PLANKTON COMMUNITIES AND PRESENT TROPHIC STATE OF LAKE STEINSFJORD,
Oslo Univ. (Norway). Dept. of Limnology.
O. K. Skogheim, and S. Rogenrud.
Archiv fur Hydrobiologie, Vol 83, No. 2, p 179-199, June 1978. 12 fig, 4 tab, 32 ref.

Descriptors: *Lake Steinsfjord(Norway), Limnology, *Eutrophication, *Phytoplankton, *Zooplankton, *Trophic level, *Food chains, Mesotrophy, Norway, Lakes, Hydrography, Metabolism, Energy transfer, Primary productivity, Dissolved oxygen, Bioindicators, Food habits, Grazing.

Comparisons of a 1972-73 limnological investigation of Lake Steinsfjord in southeastern Norway with data from earlier studies shows both quantitative and qualitative changes in the planktonic community which indicate increasing eutrophication, though the lake is classified as mesotrophic. Human influence is probably responsible for this enrichment. Despite as years of increased plankton biomass, anaerobic conditions have not developed in the hypolimnion due primarily to highly dynamic energy metabolism in the epilimnion and the general hydrographic features of the lake (including high hypolimnetic temperature and early autumn turnover). In late summer and early autumn 60-80% of primary production is assimilated by nannoplankton-feeding zooplankton. The appearance and increase of several phytoplankton species indicate increasing eutrophication: Oscillatoria rubescens, Aphanizomenon flos-aquae, Asterionella formosa, Tabellaria fenestrata, and Fragilaria crotonensis. The quantative increase in phytoplankton biomass has a correspondingly increased zooplankton, especially in herbivorous species Daphnia galeata and Eudiaptomus gracilis. The appearance of Mesocyclops leuckarti, M. oithonoides, and Daphnia cristata may indicate eutrophication. This paper focuses on composition and biomass of phytoplankton and zooplankton and interrelationships between the two trophic levels. (Lynch-Wisconsin)
W79-02250

A COMPUTER SIMULATION OF PHOSPHATE AND NITROGEN TRANSPORT BY WATER RUNOFF,
Technion - Israel Inst. of Tech., Haifa. Soils and Fertilizers Lab.
For primary bibliographic entry see Field 5B.
W79-02251

PARTICULATE AND DISSOLVED ORGANIC MATTER IN A SMALL PARTLY FORESTED ONTARIO STREAM,
Waterloo Univ., (Ontario). Dept. of Biology.
D. L. Lush, and H. B. N. Hynes.
Hydrobiologia, Vol. 60, No. 2, p 177-185, 1978. 8 fig. 19 ref.

Descriptors: *Streams, *Particles, *Organic matter, *Dissolved solids, *Particle size, *Laurel Creek(Ontario), Ontario(Canada), Canada, Carbon, Forest watersheds, Rainfall, Proteins, Carbohydrates, Insects, Invertebrates, Secondary productivity, Chlorophyll, Pigments, Biological communities.

Particulate organic matter (POM) and dissolved organic matter (DOM) fluctuated considerably during a study in the headwaters of Laurel Stream, a small, partially forested, relatively undisturbed stream in Ontario, Canada; rainfall had a strong influence on inputs of organic matter. Five stations were sampled weekly from April thaw until freeze-over in late November 1971. Biota of most streams are greatly dependent on allochthonous organic matter, which fluctuates between DOM (<0.5 micrometer) and POM states. Coarse particles are readily eaten by invertebrates and fine particles are eaten by such specialists as blackfly larvae and net-spinning caddisworms. DOM apparently is not directly eaten, but is rapidly removed from the stream system and presumably becomes available as food. In this study size distribution of POM varied irregularly. Rainfall tended to increase their total quantity as well as their dissolved organic carbon (DOC) concentration; other local factors also affected particle supply. High POM concentration was associated with high amounts of plant pigments, carbohydrate, and protein. Similarly, rain-caused increases in DOC were accompanied by increases in dissolved carbohydrate and protein. Dissolved material behaved more predictably, with a large part rapidly removed from solution. These findings suggest a series of mechanisms by which a woodland stream may trap woodland-produced energy and cycle it through the aquatic system. (Lynch-Wisconsin)
W79-02252

CYPRESS WETLANDS FOR WATER MANAGEMENT, RECYCLING AND CONSERVATION (THIRD ANNUAL REPORT, NOVEMBER 1, 1975 TO DECEMBER 15, 1976),
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02256

CHANGES IN UNDERSTORY VEGETATION IN CYPRESS DOMES BROUGHT ABOUT BY FIRE AND ADDITION OF SEWAGE,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
K. C. Ewel.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p. 171-189, 1976. 3 fig, 6 tab.

Descriptors: *Swamps, *Aquatic plants, *Burning, *Water pollution effects, Succession, Wetlands, Florida, Marsh plants, Distribution patterns, Waste water disposal.

The effects of application of groundwater and sewage on ecological relationships in burned and unburned cypress domes was monitored over a two-year period since the initial treatments. There were rapid changes in dominace and invader species of understory vegetation for the burned, sewage dome than in any of the others. The duckweed layer is also thicker. The presence of sewage does not seem to have had an overriding influence in determining vegetation; however, the two sewage domes are less similar to one another in species composition than are the two burned domes. The similarity index for the species composition shortly after sewage introduction and one year later was 78 (possible maximum of 86) for the unburned dome, but only 62 for the burned dome, suggesting greater constancy for the flora in the second sewage dome in response to the stress of sewage. This suggests that the presence of nutrient vegetation at the time of sewage introduction has damped the kinds of changes in the unburned dome. (See also W79-02256) (Steiner-Mass)
W79-02263

UPTAKE AND DISTRIBUTION OF PHOSPHORUS IN THE UNDERSTORY OF CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
G. S. Deghi.
In; Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p. 193-196, 1976.

Descriptors: *Swamps, *Marsh plants, *Phosphorus, Wetlands, Florida, Nutrients, Sediments.

From field studies using radioacitive phosphorus, values for plant uptake of phosphorus and incorportation of phosphorus into the sediments and detritus was determined. Ion uptake in duckweed and Utricularia is ten to one hundred times greater than in the two emergent species, Woodwardia and Saururus. Radioactivity of rinsed sediment samples and filtrates was similar to background counts. The upper 10 cm of the organic sediments has few exchange sites and the P32 becoming incorportated into the sediment is absorbed at a greater depth. (See also w79-02256) Steiner-Mass)
W79-02264

LITTERFALL AND LITTER DECOMPOSITION IN FOUR CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02265

AIR EMISSIONS FROM CYPRESS SWAMPS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Science; and Florida Univ., Gainesville. Center for Wetlands.
A. A. Linero.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 269-294, 1976. 2 fig, 4 tab, 7 ref, 3 append.

Descriptors: *Swamps, *Water pollution effects, *Gases, Wetlands, Florida, Waste water disposal, Methane.

This study was undertaken to determine the types and quantities of gases being emitted from a sewage-fed cypress dome and to compare these with emissions taken from a control dome. Data from the sewage-fed dome indicates that reactions occur characteristic of the anaerobic digestion of organic matter by bacteria which exist in the water and/or sediments. These reactions account for the presence of carbon dioxide, methane, and hydrogen sulfide. While no gas was evolved and collected from the natural dome, it was concluded that similar processes do occur in the sediments. The method of floating collectors is useful in directly determining emissions of soluble gases such as methane. The method is also useful in determining equilibrium vapor pressures of soluble components such as sulfur dioxide and carbon dioxide. From equilibrium vapor pressure data emission factors can be calculated from transport phenomena calculations. The method is not useful for determining nitrogen and oxygen emissions since the natural tendency is the equilibrium between partial pressures in the atmosphere, the vials, and the liquid phase. (See also W79-02256) (Steiner-Mass)
W79-02266

THE RESPONSE OF BENTHIC INVERTEBRATE POPULATIONS TO SEWAGE ADDITION,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
R. S. Brightman, and J. L. Fox.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 295-308, 1976. 2 fig, 6 tab, 1 ref.

Descriptors: *Swamps, *Water pollution effects, *Invertebrates, *Distribution patterns, *Bioindicators, Wetlands, Florida, Waste water disposal, Aquatic animals, Ecological distribution, Water analysis, Water quality.

A decrease in invertebrate diversity observed in cypress domes used to dispose of secondarily treated sewage can be interpreted as indicating an increase in stress. The major form of stress was increased organic material causing oxygen depletion. As organisms died off, the species composition shifted toward those organisms able to tolerate the low oxygen levels. These tolerant organisms became more abundant because of the elimination of their competitors and predators. This caused an invertebrate assemblage dominated by a few species containing many individuals, by definition, low diversity. More meaningful than a single idea was the spatial variation in the sewage domes. The characteristics of the sewage dome centers were those of heavily polluted waters. These characteristics became increasingly indicative of cleaner water as distance from the sewage dome centers increased. The cypress domes, acting as natural treatment systems, improved the water quality as it moved from the center. The response of the invertebrates to the sewage effluent may be useful in determining when it is time to stop loading a specific dome in a system of alternative sites. Invertebrates may also be useful in determining proper loading rates, avoiding the alteration of sites altogether. (See also W79-02256) (Steiner-Mass)
W79-02267

COLIFORM MONITORING OF WATERS ASSOCIATED WITH THE CYPRESS DOME PROJECT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. Allinson, and J. Fox.
In: Third Annual Report on Cypess Wetlands, Florida University, Center for Wetlands, Gainesville, p 309-320, 1976. 3 fig, 4 tab.

Descriptors: *Swamps, *Water pollution effects, Wetlands, Florida, Waste water disposal, Bacteria, Sewage.

Cypress domes appear to be effective in preventing fecal coliforms from percolating through the soil to the groundwater. Overflow of the cypress domes used for dumping secondarily treated sewage appears to be the major cause of infilration of coliforms into shallow groundwater. Coliform numbers are highest near the inflow of the sewage effluent and decrease with distance toward the edges. (See also W79-02256)(Steiner-Mass)
W79-02268

WATER QUALITY OF CYPRESS DOMES: ROUTINE SAMPLING PROGRAM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Scientific; and Florida Univ., Gainesville. Center for Wetlands.
F. E. Dierberg, and P. L. Brezonik.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 337-371, 1976. 12 fig, 5 tab, 5 ref.

Descriptors: *Swamps, *Water pollution effcts, *Biochemical oxygen demand, Wetlands, Florida, Waste water disposa, Sewage, Dissolved oxygen, Nutrients.

Surface water quality in cypress domes receiving secondarily treated sewage consistently exceeded the level for Biochemical Oxygen Demand (BOD), total P, and total N recommended in the effluent waters from tertiary sewage treatment plants by current State of Florida Standards. The capability of the cypress domes to reduce and/or remove nutrients and oxidizable organics in the sewage therefore does not compare to that of an advanced sewage treatment plant. At the present sewage application rates of one inch per week, surface water quality parameters affected adversely include dissolved oxygen, BOD, sulfide, and nutrients, the levels of which support large standing crops of aquatic angiosperms. The soft, acid water normally found in cypress domes has been altered to a neutral, moderately-hard condition. There are significant seasonal and spatial variations in the levels of chemical parameters. (See also W79-02256)(Steiner-Mass)
W79-02269

DENITRIFICATION AND SURFACE RUNOFF IN THE EXPERIMENTAL DOMES: CYPRESS WETLANDS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Centre for Wetlands.
F. E. Dierborg, and P. Brezonik.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 383-404, 1976. 2 fig, 6 tab, 2 ref.

Descriptors: *Swamps, *Water pollution effects, *Nutrients, *Wetlands, Florida, Waste water disposal, Sewage, Phosphorus, Nitrogen.

Denitrification occurs to only a limited extent in cypress domes receiving secondarily treated sewage. The most liberal calculation suggests a maximum of only 11% of the total N pumped in could be lost via denitrification. Nutrients entering the domes via surface runoff are of minor importance compared to the nutrient loading from the sewage. Annual total N and P loading from surface runoff contributed only 3-6% and 1-2%, respectively, compared to the sewage. Maximum concentrations for nitrogen species were found to occur at the initial onset of surface runoff and to decrease with time. (See also W79-02256) (Steiner-Mass)
W79-02270

RATES OF GROWTH AND NUTRIENT CONCENTRATIONS OF TREES IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
D. M. Post, P. A. Straub, and W. Smith.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 422-446, 1976. 22 tab.

Descriptors: *Swamps, *Water pollution effects, *Plant growth, *Nutrients, Wetlands, Florida, Waste water disposal, Sewage, Trees, Growth rates, Phosphorus, Nitrogen.

Concentrations of nitrogen and phosphorus have not increased appreciably in trees growing in domes receiving secondarily treated sewage. Phosphorus did show more of an increase than did nitrogen, however. Core samples for Nyssa biflora and Pinus elliotti indicate that these species may be more sensitive to phosphorus increases than the cypress, Taxodium distichum. Phosphorus levels in the cores from cypress trees in the sewage domes are twice as high as the levels in cores on the natural control dome. Domes receiving sewage or having been burnt previously had significantly greater tree growth than did a control dome. (See also W79-02256)(Steiner-Mass)
W79-02271

GROWTH RATES OF SEEDLINGS PLANTED IN CYPRESS DOMES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
G. S. Deghi.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 453-469, 1976. 9 fig, 1 append.

Descriptors: *Swamps, *Water pollution effects, *Plant growth, Wetlands, Florida, Waste water disposa, Sewage, Trees, Growth rates, Vegetation establishment.

Three species of seedlings, tupelo, bald cypress, and pond cypress, responded differently to the addition of secondarily treated sewage effluents. Input of sewage seems to be detrimental to the growth of tupelo and young bald cypress seedlings. This is possibly related to stresses caused by an anaerobic environment. Older bald cypress seedlings (greater than six months) in the sewage dome exhibited similar growth patterns as control dome seedlings. The increased nutrient input in the sewage domes seems to stimulate the long-term growth of pond cypress seedlings. (See also W79-02256)(Steiner-Mass)
W79-02272

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON SURROUNDING SOIL MOISTURE AND NUTRIENT CONTENT AND ON GROWTH OF PINE TREES (SUMMARY OF MS THESIS),
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
P. E. Okorie.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 470-503, 1976. 7 fig, 2 tab, 58 ref.

Descriptors: *Swamps, *Water pollution effects, *Plant growth, *Soil moisture, Wetlands, Florida, Waste water disposal, Sewage, Trees, Growth rates, Nutrients, Hydrogen ion concentration.

The surface soil moisture content was highest near the pond and decreased with distance from the pond margins. At a depth of 30.5 cm, the moisture content of the soil at the sewage dome was significantly higher than the control at a distance of 20 m from the pond edge. The pH of the soil at a depth of 80 to 100 cm was higher for the control by a range of 0.35 at 20 m to 1.3 at 5 m from the edge of the pond, indicating the modifying effect the treated pond could have on the pH of the surrounding soils. Results of foliar analysis showed no profound

effect on nutrients levels due to effluent application. Nevertheless, amounts of N, K, and Mg were higher at the flooded edge of the pond than farther out in the drier areas. The fact that trees near the pond with their roots in the waterlogged soils were growing at almost the same rate as those on drier lands farther from the edge indicated that additional nutrients from the effluent raised the nutrient levels of the soil around the roots thus enabling them to withstand effectively the deleterious effects of waterlogging and high pH. (See also W79-02256)(Steiner-Mass)
W79-02273

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON GROWTH OF SURROUNDING PINE SEEDLINGS AND TREES,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
P. E. Okorie.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 504-509, 1976. 3 fig, 1 ref.

Descriptors: *Swamps, *Water pollution effects, *Plant growth, *Pine trees, Wetlands, Florida, Waste water disposal, Sewage, Trees, Growth rates.

In both cypress domes receiving secondarily treated wastes and control domes, growth response still appeared to be related to varying drainage conditions of the soil. The seedlings near the treated dome had almost the same height increments as those farther away. Very likely, the nutrients in the effluent had started to move out from the dome. This coupled with the modification of the soil pH could be responsible for narrowing the margin of difference between height increments of the seedlings near the pond and those far away from it. Height increments were higher for trees near the dome than those farther away. Possibiy, the trees near the dome benefited from the nutrients and water in the effluent, particularly during a dry season. (See also W79-02256)(Steiner-Mass)
W79-02274

SEDIMENTATION RATES: CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Soil Science.
J. E. Struble, and D. A. Graetz.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 510-515, 1976. 5 fig.

Descriptors: *Swamps, *Water pollution effects, *Sedimentation rates, Wetlands, Florida, Waste water disposal, Sewage, Detritus.

Field data were collected on the rate of sedimentation in two cypress domes receiving sewage effluent and one receiving groundwater. For each dome the sedimentation rate is greater for the traps that are closer to the center. This may be due to the fact that the discharge pipes are near the center in each of the domes. The traps that are within 10 meters of the center may be picking up material that gets resuspended during effluent or water discharge to the dome. The three domes show a difference in sedimentation rates. In sewage dome 1, the average rates range from 5.07 to 18.85 g/sq m/day as compared to 5.23 to 10.77 g/sq m/day for sewage dome 2, and 6.14 to 8.3 g/sq m/day for the groundwater dome. In the sewage domes the majority of the material collected is very flocculant; they also have duckweed which settled to the bottom. The material in the groundwater dome consists more of litter that has fallen. (See also W79-02256) (Steiner-Mass)
W79-02275

NITROGEN TRANSFORMATIONS IN WATER AND SEDIMENTS OF CYPRESS DOMES WITH AND WITHOUT ADDED SEWAGE EFFLUENT,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 2H.
W79-02276

DISTRIBUTION OF CHLOROPHYLL IN CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02278

THE EFFECTS OF PERTURBATION ON CYPRESS DOME ANIMAL COMMUNITIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
W. Jetter, and L. D. Harris.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 577-653, 1976. 38 fig, 5 tab, 17 ref, 3 append.

Descriptors: *Swamps, *Water pollution effects, *Aquatic animals, *Aquatic habitats, Wetlands, Florida, Waste water disposal, Sewage, Aquatic insects, Diptera, Frogs, Amphibians, Wildlife, Birds, Water birds, Mammals, Freshwater fish, Invertebrates, Small animals(Mammals).

Important structural and functional changes occur in the consumer communities of cypress domes receiving treated sewage. Shifts in the type and amounts of food available have caused populations of key groups of animals to be altered. With the formation of a floating mat of organic material on the pond surface, there is a massive shift from aquatic detritivores which complete their life cycle within and upon the organic mat. This attracts numerous frogs to the site but tadpole development is prevented because of the anaerobic conditions. The frog population consists totally of migrants from neighboring, untreated domes. Many fish and aquatic invertebrate species are also eliminated because of the anaerobic conditions. Birds feeding on these aquatic organisms decrease in numbers while species feeding on the organic mat detritivores increase. In addition to shifts in total numbers and biomass, marked changes occurred in the spatial distribution of the birds within the sewage domes. Sewage treatment probably had a positive effect on small mammal populations because of more vigorous and nutritious vegetation growth. (See also W79-02256) (Steiner-Mass)
W79-02279

COMPARISON OF FALL BIRDS PRESENT IN A NATURAL CYPRESS DOME, AND THE ADJACENT PINE PLANTATION,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
A. Ramsay.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 654-670, 1976. 5 tab, 21 ref.

Descriptors: *Swamps, *Water pollution effects, *Song birds, Wetlands, Florida, Waste water disposal, Birds.

The number of species detected varied from a low of eight in the natural dome center to a high of fifteen in the sewage dome ecotone. The mean species number observed in the sewage dome ecotone was significantly different from the other sampled areas except for the pine plantation. The value obtained from the plantation was significantly different only from the natural dome ecotone. Mean diversity shows the same relationship: no significant differences were found in equitability (evenness) values between study areas; therefore, differences in diversity can be attributed to differences in species richness. The highest avian diversity was found in the sewage dome ecotone with the pine plantation second. The natural cypress dome ecotone showed the lowest diversity. Most birds observed were common residents or common winter visitors in this area. The phoebe, white-eyed vireo, and swamp sparrow were seen in association with the sewage dome, while robins were detected in conjunction with the natural dome and plantation. Both study domes showed a similarity index of approximately 65% when compared to their respective ecotones. The two dome centers showed a similarity of 44%, while the value between ecotones was 48%. (See also W79-02256) (Steiner-Mass)
W79-02280

CYPRESS GROWTH RESPONSE IN A SEWAGE-ENRICHED POND CYPRESS ECOSYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
M. S. Burnett.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville. p 812-817, 1976. 1 tab.

Descriptors: *Swamps, *Waste water disposal, *Trees, *Growth rates, Wetlands, Florida, Water pollution effects, Sewage.

The average of the ratios comparing the growth of cypress trees during the enrichment period to that during the baseline period was 1.0 in the control dome and 2.6 in the sewage dome. While the cypress growth rate remained essentially unchanged during the enrichment period in the control plot, it more than doubled in the sewage-enriched plot. (See also W79-02256)(Steiner-Mass)
W79-02287

LAND USE AND INTENSIVE RANGE MANAGEMENT IN THE SIERRA NEVADA FOOTHILLS--A CONTEMPORARY ANALYSIS,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 4D.
W79-02293

A PALEOLIMNOLOGICAL COMPARISON OF BURNTSIDE AND SHAGAWA LAKES, NORTHEASTERN MINNESOTA,
Geological Survey, Denver, CO.
J. P. Bradbury.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 298, Price codes: A04 in paper copy, A01 in microfiche. Publication No. EPA-600/3-78-004, January 1978. 50 p, 13 fig, 6 tab, 49 ref. P.O. No. 04J1PO-0605.

Descriptors: *Burntside Lake(MN), *Shagawa Lake(MN), *Trophic level, *Paleolimnology, *Eutrophication, *Limnology, Lakes, Minnesota, Oligotrophy, Diatoms, Primary productivity, Algae, Phytoplankton, Palynology, Lake restoration, Water pollution effects, Geology, Nutrients.

Paleolimnological studies of two adjacent lakes in northeastern Minnesota show that Burntside Lake has been less productive than Shagawa Lake for at least 2,000 years, long before the latter became enriched after 1886 with the arrival of white settlers. Causes for the natural difference in productivity are not clearly known, as both lakes occur within the same vegetation type and share much of their water. Differences may be due to relative size of drainage area and variations in bedrock geology. While settlement around Shagawa Lake has resulted in nutrient inputs which increased productivity and caused massive cyanophyte blooms, Burntside Lake has been spared intensive eutrophication. However, the diatom record of Burntside Lake indicates that nutrients derived from shoreside cabins and construction have been increasing the lake's productivity. Results suggest that paleolimnological studies may provide better comparative information for lake rehabilitation programs than do biological and chemical analyses of contemporary unpolluted water bodies. Shagawa Lake occupies a terrane of easily weathered metasedimentary and metavolcanic rocks; tributaries which cross this terrane bring dissolved ions and nutrients to the lake. Some groundwater probably enters Shagawa Lake along fracture zones as well, and can also carry nutrients. Burntside Lake lies in a dominantly granitic terrane whose rocks and minerals are slow to yield necessary ions for algal growth to the water. (Lynch-Wisconsin)
W79-02295

AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO; APPENDIX A: PLANKTONIC COMMUNITIES, BENTHIC ASSEMBLAGES, AND FISHERY,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
For primary bibliographic entry see Field 5E.
W79-02346

CONSIDERATIONS IN CONDUCTING BIOASSAYS,
WAPORA, Inc., Charleston, IL. Bioassay Lab.
For primary bibliographic entry see Field 5A.
W79-02349

AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON, EVALUATIVE SUMMARY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
H. E. Tatem, and J. H. Johnson.
Technical Report D-77-24, June 1978. 77 p, 11 tab, 9 fig, 26 ref, append.

Descriptors: *Washington, *Pollutants, *Aquatic environment, *Environmental effects, *Waste disposal sites, *Dredged material disposal, *Duwamish waterway(Wash), *Puget Sound(Wash).

A multidisciplinary approach studied physical, chemical, and biological effects of disposal of contaminated dredged material from the Duwamish River on a deepwater disposal site located in Elliott Bay. Observation of individual disposal events indicated that the sediment left the split-hull barges as a well-defined slug and reached the bottom in approximatedly 25 sec. A mound of dredged material 2.2 m high was created near the center of disposal site. No physical or chemical evidence indicated any of the material reached two reference sites located waste and west of the disposal site. Chemical analyses of in situ river sediment revealed concentrations of total sulfides and PCB's and interstitial water ammonia significantly higher than sediments from the disposal or reference sites. The disposal operation resulted in a rapid pulse of low levels of suspended solids in the water column which lasted less than 30 min. Increased levels of dissolved manganese and total PCB's in the water column were associated with the short-term increase in suspended particulate matter. Chemical analyses of animal tissues collected at the disposal and reference sites indicated the disposal operation did not result in higher levels of mercury a chromium in test animals. (WES)
W79-02350

TOXICITY, BOD, AND COLOR OF EFFLUENTS FROM NOVEL BLEACHING PROCESSES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, M. Le Bourhis, R. Wostradowski, and S. Prahacs.
Pulp and Paper Canada, Vol. 79, No. 7, p 41-47, (T235-T241), July, 1978. 2 appendices, 6 fig, 26 ref, 8 tab.

Descriptors: *Bleaching wastes, *Toxicity, *Biochemical oxygen demand, *Color, Fish, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Pulp wastes, Aquatic animals, Hardwood, Softwood, Pollutants, Chemical oxygen demand, Oxygen, Chlorine, Gases, Chlorination, Ozone, Kraft pulps, Bleaching, Chlorine dioxide, Hydrogen peroxide.

Fish toxicity data were obtained at the Pulp and Paper Research Institute of Canada for effluents from five novel high-consistency bleaching sequences for hardwood and softwood kraft pulps, viz., D(g)/P/D(g), C(g)/E(x)/D(g), O/C(g)/E(x), O/C/E, and O/D(g)/E(x), where g denotes treatment with the reagent in its gaseous form and E(x) is rapid-press caustic extraction. The O/D(g)/E(x) sequence produced the least toxic combined effluent which contained the smallest quantities of BOD, COD, and color. The lower residual chlorine concentrations of the C(g) as compared to the C effluents resulted in a lower toxicity. The calculated toxicities of E(x) effluents were less than those of E effluents at estimated steady-state conditions of multiple recycling of wash filtrates. This may be due to the use of C(g) instead of conventional C in the preceding bleaching stage. For a given pulp, both extraction methods produced similar quantities of BOD, COD, and color. Oxygen bleaching, followed by conventional chlorination and extraction treatments, does not reduce the toxicity but does reduce the BOD, COD, and color of the combined effluents. The color of combined effluents from bleaching sequences involving the use of D (chlorine dioxide) and/or P (peroxide) was lower than that of other combined effluents. (Swichtenberg-IPC)
W79-02374

FISH TEST WITH GOLDEN ORFE -- TESTING THE TOXICITY OF MATTER CONTAINED IN WATER (FISCHTEST MIT GOLDORFEN -- PRUEFUNG DER TOXIZITAET VON WASSERINHALTSSTOFFEN),
Technische Univ., Darmstadt (West Germany). Wasser und Abwasserforschungstelle.
L. Gottsching, and A. Geller.
Das Papier, Vol. 32, No. 5, p 201-208, May, 1978. 3 fig, 2 illus, 21 ref, 3 tab. English summary.

Descriptors: *Pulp wastes, *Toxicity, *Bioassay, *Fish, Water analysis, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Foreign countries, Suspended solids, Chemical oxygen demand, Mercury, Cadmium, Legal aspects, Europe, Legislation, Ammonium compounds, Sulfonates, Aquatic animals, Furfural, Golden orfe, False goldfish(Leuciscus idus melanotus), Guppies, West Germany.

According to the West Germany Waste Water Discharge Tax Law in force since January 1978, the harmfulness of water is determined by the following parameters: suspended solids, COD, mercury and cadmium contents, and toxicity to fish. The toxicity tests are compared for Germany, Great Britain, France, Italy, and the United States. Acute toxicity of water to fish is determined by dilution sequences. In Germany there is a test for guppies and a test for the golden orfe or false goldfish (Leuciscus idus melanotus), the latter being the subject of this study. The legal basis, limits of the test, and problems for the pulp and paper industry are discussed. The resuls of interlaboratory tests by a subcommittee of the German Committee on Detergents are reported, with emphasis on results relevant to the pulp and paper industry. Some toxic control substances of interest are quaternary ammonium compounds, sodium dodecyl sulfonate, and furfural. Basic problems of bioassay procedures are also treated. (Ward-IPC)
W79-02375

CONVERSION OF LIGNOSULFONATES IN NATURAL WATERS (PREVRASHCHENIE LIGNOSUL'FONATOV V PRIRODNYKH VODAKH),
Gidrokhemicheskii Inst., Novocherkassk (USSR).
For primary bibliographic entry see Field 5B.
W79-02379

AQUATIC VASCULAR PLANTS OF LAKE APOPKA, FLORIDA,
Georgia Coll., Milledgeville. Inst. of Natural Resources.
For primary bibliographic entry see Field 2I.
W79-02420

THE RELEASE OF PLANT NUTRIENTS FROM REED BORDERS AND ITS TRANSPORT INTO THE OPEN WATERS OF THE BODENSEE-UNTERSEE, (IN GERMAN),
V. R. Schroder.
Archiv Hydrogiologie, Vol. 71(2), p 145-158. January, 1973. 5 fig, 3 tab, 8 ref.

Descriptors: *Wetlands, *Cycling nutrients, *Eutrophication, Nutrients, Phosphorus, Lakes, Marsh plants, Currents(Water).

The effect that reed borders have on eutrophication was investigated for a nutrient-rich and artificially eutrophied lake. In situ experiments provided the basis for calculating the daily amounts of phosphorus and nitrogen compounds that were released from the reeds. Measurements of the direction and velocity of the water current in the reed area indicated that the material released was carried to the lake by a bottom current while another current flows near the surface in the opposite direction. In the case of the Bodensee-Untersee, the littoral zone, which is partially inhabited by reeds, accounts for about 10% of the total phosphorus load. Owing to the seasonal fluctuations in the lake level and the resulting flooding of the littoral zone, a nutrient input occurs. The maximum of this nutrient input takes place when the phosphate concentration in the lake is at a minimum. Consequently, the eutrophying effect of the littoral zone can be importance for the total balance. (Steiner-Mass)
W79-02422

EFFECT OF DISSOLVED OXYGEN AND REDOX POTENTIAL AND NITRATE REMOVAL IN FLOODED SWAMP AND MARSH SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
R. M. Engler, D. A. Antie, and W. H. Patrick, Jr.
Journal of Environmental Quality, Vol. 5, No. 3, p 230-235, 1976. 6 fig, 2 tab, 14 ref.

Descriptors: *Coastal marshes, *Nitrates, Wetlands, Marshes, Swamps, Muck soils, Nitrogen cycle, Fertilizer, Nutrients, *Dissolved oxygen, *Oxidation-reduction potential, *Nutrient removal.

Flooded and marsh soils in the flooded swamp and marsh soils in the interior swamp and coastal areas of Louisiana have a high capacity for removing NO sub 3 (-). Nitrate added either to the shallow floodwater or mixed in the soil rapidly disappeared under laboratory conditions. Nitrate loss does not take place in the floodwater, but is dependent on the NO sub 3(-) moving downward into the anaerobic soil layer. The NO sub 3(-) removal capacity is much greater than is required to handle any amount of No sub 3(-) -N that is likely to be present in these areas, either from oxidation of ammonium that has been released from organic matter or from NO sub 3(-) derived from local runoff from adjacent agricultural areas. Nitrate loss does not appear to be inhibited by the presence of a small amount of molecular O sub 2 in flooded soils. (Steiner-Mass)
W79-02426

EFFECTS OF AN ORGANIC ARSENICAL HERBICIDE ON A SALT MARSH ECOSYSTEM,
Auburn Univ., AL. Dept. of Biology; and Auburn Univ., AL. Dept. of Microbiology.
A. C. Edwards, and D. E. Davis.
Journal of Environmental Quality, Vol. 4, No. 2, p 215-219, 1975. 5 tab, 15 ref.

Descriptors: *Salt marshes, *Marsh plants, *Marine animals, *Arsenicals(Pesticides), Pesticide residues, Wetlands, Mussels, Arsenic compounds, Herbicides, Aquatic weed control, Pesticides, Bioassay, Hazards, Soil contamination, Water pollution sources.

The effects were investigated of single and repeat applications of monosodium methanearsonate on the standing crops of Spartina alterniflora (a marsh grass), Litorina irrorata (a periwinkle), and Modiolus demissus (a rib mussel). Post-treatment sampling revealed no alteration of the density of S. alterniflora; 30 applications of 10,000 ppm decreased the dry weight of living S. alterniflora; flowering shoot production was reduced by 30 applications of 10,000 or 1,000 ppm; one application of 90,000 ppm and 30 applications of 10,000 or 1,000 ppm increased the percentages of dead and necrotic tissue on living shoots; and the Littorina

population was decreased by 30 applications of 10,000 ppm. Survival of the rib mussel was not affected by flooding with 100 ppm in sea water. Arsenic levels in Spartina and soil samples were significantly increased by 30 foliar applications of 10,000 ppm or flooding 30 times with 100 ppm. Arsenic levels in Littorina and Modiolus also increased immediately following treatment. (Steiner-Mass)
W79-02427

NUTRIENTS IN SUBSURFACE AND RUNOFF WATERS OF THE HOLLAND MARSH, ONTARIO,
Ontario Ministry of the Environment, Toronto.
K. H. Nicholls, and H. R. MacCrimmon.
Journal of Environmental Quality, Vol. 3, No. 1, p 31-35, 1974. 3 fig, 2 tab, 18 ref.

Descriptors: *Marshes, *Land reclamation, *Nutrient cycling, Wetlands, Freshwater marshes, Nutrients, Nitrogen, Phosphorus, Marsh management, Drainage, Leaching, Fertilizers.

The combined effects of fertilization, drainage, and, hence, oxidizing and nitrifying conditions yield about 4 to 5 times more P and some 40 to 50 more nitrate-N in runoff water from cultivated over uncultivated marsh plots. Furthermore, the importance of overwinter leaching of P from frozen marsh vegetation has been indicated. The total P and nitrate-N lost in drainage water from the cultivated marsh plot are amounts which fall within the yearly range reported for several agricultural lands. The significance of the loading from the Holland Marsh, however, is that it is all released during a 5 to 6 week pumping period and that more than 90% of the P is in the soluble, reactive, orthophosphate form and is, therefore, available for algae and aquatic plant growth. The contribution of nutrients to the lower main channel of the marsh by the base flow of subsurface water from the fertilized and cultivated areas of marsh is considered negligible during the growing season. The reasons are the mean inorganic N and P concentrations in the subsurface water during the growing season are low and subsurface drainage presumably does not occur except when the pumps are draining the ditches in the early spring. (Steiner-Mass)
W79-02428

HAZARDOUS WASTE DISPOSAL DAMAGE REPORTS, DOCUMENT NO 2.
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5E.
W79-02443

SOME HISTOPATHOLOGICAL EFFECTS OF AROCLOR 1254 ON THE LIVER AND GONADS OF RAINBOW TROUT, SALMO GAIRDNERI, AND CARP, CYPRINUS CARPIO,
Chelsea Coll., London (England). Dept. of Pharmacology; and Chelsea Coll., London (England). Dept. of Zoology.
K. Sivarajah, C. S. Franklin, and W. P. Williams.
Journal of Fish Biology, Vol 13, p 411-414, 1978. 2 fig, 18 ref.

Descriptors: *Fish reproduction, *Cytological studies, *Mode of action, *Rainbow trout, *Aroclor 1254, *Polychlorinated biphenyls, Pathology, Bioassay, Water pollution effects, Laboratory tests, Trout, Salmonids, *Carp, Reproduction, Fish physiology, Electron microscopy, *Histological studies, Liver, Gonads.

Sexually mature male and female rainbow trout (Salmo gaidneri) and carp (Cyprinus carpio) were injected intraperitoneally with Aroclor 1254 (25 mg/kg body weight in 1 ml of arachis oil) once weekly for four weeks. Arachis oil was used as the control. At the end of the fourth week, samples of the liver, testis and ovary were taken from treated and control fish and examined by light and electron microscopy. The light microscope study indicated that there was general vacuolation of the hepatocytes of trout but not carp; fragmentation of the developing oocytes but no observable changes in the testis. Electron microscopy study showed that there was enlargement of the rough endoplasmic reticulum of the hepatocytes, some damage to spermatozoa and proliferation of the smooth endoplasmic reticulum of the oocytes. (EIS-Katz)
W79-02452

THE EFFECTS OF POLYCHLORINATED BIPHENYLS ON PLASMA STEROID LEVELS AND HEPATIC MICROSOMAL ENZYMES IN FISH,
Chelsea Coll., London (England). Dept. of Zoology; and Chelsea Coll., London (England). Dept. of Pharmacology.
K. Sivarajah, C. S. Franklin, and W. P. Williams.
Journal of Fish Biology, Vol 13, p 401-409, 1978. 2 tab, 44 ref.

Descriptors: *Aroclor, *Polychlorinated biphenyls, Biochemistry, *Enzymes, *Metabolism, *Trout, Fish physiology, Chemical properties, Inhibitors, Mode of action, Cytological studies, *Carp, Water pollution effects, Toxins, Laboratory tests, Bioassay, *Hepatic microsomal enzymes, *Steroids, Hormones, *Cytochrome P450.

Aroclor 1254 was administered intraperitoneally (25 mg/kg body weight in 1 ml of arachis oil) at weekly intervals for 4 weeks to trout and carp; arachis oil was used as the control. Activities of hepatic microsomal enzymes were measured in both species; cytochrome P450 and microsomal protein contents were also determined. The changes in the levels of androgens, oestrogens and corticoid hormones were measured in the circulating blood of control and treated groups at weekly intervals. The blood was obtained by cardiac puncture. Results indicated (a) a significant increase in the activities of all the enzymes measured except 1-leucyl-beta-naphthylamide splitting enzyme, (b) cytochrome P450 and microsomal protein contents were increased in trout, but not in carp, (c) a significant reduction in the plasma levels of androgens, oestrogens and corticoids in the treated groups, particularly at the end of the fourth week and (d) there was a correlation between increased enzyme activities and a decrease in plasma hormone levels. (EIS-Katz)
W79-02453

STUDIES OF THE ECOLOGY OF FISH POPULATIONS IN THE RYE MEADS SEWAGE EFFLUENT LAGOONS,
Chelsea Coll., London (England). Dept. of Pharmacology; and Chelsea Coll., London (England). Dept. of Zoology.
R. W. G. White, and W. P. Williams.
Journal of Fish Biology, Vol 13, p 379-400, 1978. 12 fig, 9 tab, 49 ref.

Descriptors: *Fish populations, *Sewage lagoons, *Sewage effluents, *Growth rates, *Perches, *Fish reproduction, Biological communities environmental effects, Sewage, Freshwater fish populations, Biological communities, Aquatic populations, Nutrients, Sewage disposal, Sewage treatment, Lagoons, Productivity seasonal, On-site investigations, Roach, Chubs, Rutilus, Perca, Leuciscus.

The ecology of populations of roach, chub and perch in shallow lagoons forming part of a sewage works was studied over a period of two years. The fish were netted, identified, measured and scales taken for ageing, except in the case of perch of which a limited number were killed and their opercular bones collected. The chub and perch grew faster than those from other waters and the growth rate of the roach equalled that of the best European populations. Breeding success was irregular, particularly with the chub, and a relatively low population density and the high potential productivity of the lagoons could explain the rapid growth rate. (EIS-Katz)
W79-02454

THERMAL TOLERANCE AND PREFERENCE OF THE INDIAN CATFISH HETEROPNEUSTES FOSSILIS,
Delhi Univ. (India). Dept. of Zoology.
S. Vasal, and B. Sundararaj.
Environment Biology of Fish, Vol. 3, No. 3, p 309-315, 1978. 2 tab, 5 fig, 29 ref.

Descriptors: *Water temperature, Environmrntal effects, *Catfish, *Fish behavior, *Letal limit, Freshwater fish, Laboratory tests, Seasonal, Heated water, Temperature, Resistance, Methodology, *Indian Catfish, Hetropneustes, *Heterothermal environments, *Thermal tolerance, Thermal preference.

The catfish Heteropneustes fossils tolerates a wide range of temperatures. The minimal (7.9C) and maximal (39.8C) lethal temperature values obtained during summer are higher than the minimal (4C) and maximal (37.7C) lethal temperature values obtained during water; gradual heating or cooling versus abrupt exposure to various temperatures did not produce significant differences. Catfish acclimated to temperatures of 28 degrees (summer) or 16 degree C (winter) finally selected temperatures ranging from 31.3 degrees to 32 degrees C, when placed in a temperature gradient of 15 degrees to 35 degrees C. Catfish avoid temperatures below 25 degrees C regardless of seasonal acclimatization. (EIS-Katz)
W79-02455

ORGANOCHLORINE AND MERCURY RESIDUES IN FISH FROM LAKE SIMCOE, ONTARIO 1970-76,
Ontario Ministry of Agriculture and Food, Guelph. Pesticide Residue Lab.
For primary bibliographic entry see Field 5B.
W79-02456

INFLUENCE OF SILVER CARP (HYPOPHTALMICHTHYS MOLITRIX) ON PLANKTON OF SHALLOW WATERS ACCORDING TO INVESTIGATIONS IN CARP PONDS (WIRKUNGEN VON SILBERKARPFEN (HYPOPHTHALMICHTMYS MOLITRIX) AUF DAS PLANKTON IN FLACHCEWASSERN NACH UNTERSUCHUNGEN IN KARPFENTEICHEN),
Institut fuer Binnenfischerei, Berlin (East Germany).
D. Barthelmes, and K. Kleibs.
Internationale Revue Gesamten Hydrobiologie, Vol. 63, No. 3, p 411-419, 1978. 5 fig, 1 tab, 11 ref.

Descriptors: *Carp, *Plankton, *Aquiculture, *Aquatic populations, *Productivity, Fisheries, Fish stocking, Phytoplankton, Zooplankton, On-site data collections, Ponds, Fish management farm ponds, *Eutrophication, Fish food organisms, Cyanophyta, Hypophthalmichthys.

No severe changes take place in the plankton of highly eutrophic nonstratified water bodies under the climatic conditions of the GDR provided that stocking rates do not exceed 1,000 Si3/ha. In such waters it is possible to get an additional yield of 200 to 300 kg/ha with a stocking rate of 1,000 Si3/ha. This yield is based mostly on microphytoplankton and finer zooplankton, both fractions luxuriating with enhanced trophy. Stocking rates of the order of 10,000 Si3/ha allow selective overexploitation of microphytoplankton including bluegreens and nearly all zooplankton. This may be of interest to fishery management (also because of yields of up to 1 t/ha) as well as to water technology. (EIS-Katz)
W79-02457

THE CRUSTACEAN ZOOPLANKTON OF GRASMERE BEFORE AND AFTER A CHANGE IN SEWAGE EFFLUENT TREATMENT,
Freshwater Biological Association, Ambleside, (England).
W. J. P. Smyly.
Internationale Revue Gesamten Hydrobiologie, Vol. 63, No. 3, p 389-403, 1978. 1 tab, 7 fig, 20 ref.

Descriptors: *Crustaceans, *Zooplankton, *Sewage effluents, *Plankton, *Sewage treatment, *Aquatic populations, Daphnia, On-site investigations, Biological communities, Water pollution effects, Oxygen, Domestic wastes, Water pollution sources, Copepods, Mollusks, Rotifers, Dissolved oxygen, Water quality, Seasonal, *Lake Grasmere(England).

The limnetic crustaceans of Grasmere, a small lake in the English Lake District, were studied from February 1969 to December 1970 (23 months) and from January to December 1975. These observations were made before and after a change in sewage effluent treatment effected in May 1971. Planktonic species, except for one cladoceran, were more abundant in the second that the first period, while hypolimnetic and profundal forms either became less abundant or modified their lifestyle in conjunction with a developing hypolimnetic oxygen-deficit. (EIS-Katz)
W79-02458

POSSIBLE TOXIC EFFECTS OF THE MARINE BLUE-GREEN ALGA, SPIRULINA SUBSALSA, ON THE BLUE SHRIMP, PENAEUS STYLIROSTRIS,
Arizona Univ., Tucson. Environmental Research Lab.
D. V. Lightner.
Journal of Invertebrate Pathology, Vol. 32, p 139-150, 1978. 9 fig, 1 tab, 19 ref.

Descriptors: *Aquiculture, *Shrimp, *Commercial shellfish, *Animal diseases, *Cyanophyta, *Toxicity, *Marine algae, Eutrophication, Microbiology, Animal pathology, Microorganisms, Marine bacteria infection, Aquatic microorganisms, Invertebrates, Crustaceans, Epizootiology, Spirulina, Penaeus, Vibrio, *Toxigenic algae, *Histology.

Blooms of a marine species of blue-green algae identified as Spirulina subsalsa were found to be related to a particular disease syndrome in raceway-reared blue shrimp, Penaeus stylirostris. The disease was characterized by necrosis of the lining epithelium of the midgut, dorsal cecum, and hindgut gland, and a consequent hemocytic enteritis. Bacterial infections due predominantly to Vibrio alginolyticus were common in affected shrimp and presumed to be a secondary condition resulting from necrosis of the gut epithelium. These bacterial infections were expressed as local abscesses near or on the gut or as fulminating septicemias. (EIS-Katz)
W79-02459

FURTHER DATA ON HEAVY METALS AND ORGANOCHLORINES IN MARINE MAMMALS FROM GERMAN COASTAL WATERS,
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Isotopenlaboratorium.
For primary bibliographic entry see Field 5B.
W79-02460

ECOLOGICAL EFFECTS OF COOLING WATER OF A POWER PLANT AT KIEL FJORD,
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
H. Moller.
Berichte der Deutschen Wissenschaftlichen Kommission fur Meeresforschung, Vol 26, No 3-4, p 117-130, 1978. 7 fig, 6 tab, 49 ref.

Descriptors: *Water temperature, Powerplants, *Cooling water, *Zooplankton, *Fish, Food organisms, *Discharge(Water), Benthic fauna, Productivity, Environmental effects, Benthos, Currents(Water), Biological communities, Aquatic environment, Movement, Eels, Mussels, Ecosystems, *Kiel fjord, *Impingement.

Effects of temperature increase are of little importance when compared with effects of artificial currents. Near the discharge as well as near the intake an increased transport of planktonic food causes an elevated production of zoobenthos. Cod and eel are attracted into this area because of favourable food conditions. There is no rise in the incidence of fish infected with parasites or diseases in the outlet area. The number of fish damaged at the intake screens is low. Settling of blue mussel and barnacles in relatively deep bottom regions near the discharge indicates a good supply of oxygen in this area. Changes in the macrobenthic fauna due to plant operation were limited to an area of about 0.01 sq km. There was a mass invasion of shore crabs and eels into the discharge area after a close down of the plant in the summer. Ten days after the close down, the benthic population in front of the plant was reduced sharply. (EIS-Katz)
W79-02461

INFLUENCE OF WATER SOLUBLE EXCRETA ON OXYGEN CONSUMPTION OF TILAPIA ZILLII,
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
H. Schulze-Wiehenbrauck.
Berichte der Deutshen Wissenschaftlichen Kommission fur Meeresforschung, Vol 26, No 3-4, p 131-136, 1978. 1 fig, 4 tab, 15 ref.

Descriptors: *Tilapia, Water quality, Environmental effects, *Metabolism, *Fish physiology, *Respiration, *Nitrogen compounds, Freshwater fish, Aquatic animals, Juvenile growth stage, Methodology, Nitrogen, Oxygen, *Oxygen demand, Laboratory tests, Water pollution effects, Nitrogen cycle, Excreta, *Fish wastes.

The influence of water, conditioned with fish excreta, was tested by measuring the oxygen consumption of juvenile Tilapia zillii (0.7 to 24.8 g wet weight). The results indicate a slight increase of aerobic metabolism in a loaded water regime, thus confirming other results found in crowded conditions, where fish metabolism was increased and energy utilization decreased. Single fish showed a reduced oxygen consumption, compared with the mean of grouped fish. (EIS-Katz)
W79-02462

UPTAKE, RETENTION AND LOSS OF CADMIUM BY BROWN SHRIMP, (CRANGON CRANGON),
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Inst. fuer Kuesten- und Binnenfischerei.
For primary bibliographic entry see Field 5B.
W79-02463

ON THE UPTAKE OF THREE DIFFERENT TYPES OF HYDROCARBONS BY SALMON EGGS (SALMO SALAR L.),
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
W. W. Kuhnhold, and F. Busch.
Berichte der Deutschen Wissenschaftlicher Kommission fur Meeresforschung, Vol 26, No 1-2, p 50-59, 1978. 20 ref, 3 fig, 4 tab.

Descriptors: *Absorption, *Fish eggs, *Salmonids, *Metabolism, Hatching, *Biological membranes, Fish reproduction, Water pollution effects, Organic compounds, Environmental effects, Laboratory tests, Growth stages, Fish physiology, Biochemistry, Membrane processes, *Bioaccumulation, *Naphthalene, *Benzopyrene, Penetration.

This study compares the difference in accumulation of carbon radioactive naphthalene, 3,4-benzopyrene and n-hexadecane in salmon eggs (Salmo salar) just prior to hatching. The test concentrations ranged from 4.6 to 13.9 ppb and also 0.2 ppb for naphthalene. Whole eggs as well as single dissected parts of eggs were analysed for hydrocarbon uptake with time. The comparison of the regression coefficient b of the accumulation equation, $\log y = \log a + b \log x$, show a similar behavior for naphthalene and benzopyrene and a much slower accumulation and penetration for hexadecane which is even lower than for a naphthalene solution of 1/20 concentration. The penetration (portion of penetrated hydrocarbon to total accumulation) is fastest in naphthalene; 98% in 12 hours, 85% for benzopyrene. In hexadecane the penetration seems to slow down, the portion accumulated on the chorion increases. Hydrocarbons that penetrated the chorion are accumulated most in the yolk and egg fluid. The data are discussed in regard to possible hydrocarbon metabolism. (EIS-Katz)
W79-02464

EFFECTS OF SOME ENVIRONMENTAL FACTORS ON GROWTH AND FOOD CONSUMPTION OF THE BALTIC PALAEMONID SHRIMP, PALAEMON ADSPERSUS VAR. FABRICII (RATHKE),
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
N. M. Inyang.
Berichte der Deutschen Wissenschaftlichen Kommission fur Meeresforschung, Vol 26, No 1-2, p 30-41, 1978. 29 ref, 8 tab, 3 fig.

Descriptors: *Salinity, Environmental effects, *Growth rates, *Water temperature, *Shrimp, *Diets, *Metabolism, *Aquiculture, Laboratory tests, Temperature, Crustaceans, Invertebrates, Commercial shellfish, Fish diets, Fish food organisms, Brine shrimp, Palaemon, *Artemia.

Experimental studies with Palaemon adspersus var. fabricii show that its growth rate is influenced by the amount and kind of food, water temperature and salinity. The average growth rate of the shrimp on half the normal daily food intake (feeding with adult Artemia) reached about 40% of the weight increase of the individuals fed to satiation. Feeding with Artemia and Crangon gave a better growth rate than with Mytilus and Tubifex. The percentage weight increase at 20C was twice that at 15C. At 20C growth was better at 18% salinity than at 10% and 35% salinities. The amount of food (adult Artemia) consumed by the shrimp (av. length 30 mm) at 20C was about 4.5 mg (dry weight) per shrimp per day. Food consumption and food conversion efficiency was higher at 20C than at 15C. Salinity also influenced the amount of food intake. (EIS-Katz)
W79-02465

THE INFLUENCE OF SALINITY AND TEMPERATURE ON GROWTH, METABOLISM AND LETHAL TEMPERATURE OF THE SAND GOBY, POMATOSCHISTUS MICROPS K. (DER EINFLUSS VON SALZGEHALT UND TEMPERATUR AUF WACHSTUM STOFFWECHSEL UND LETALTEMPERATUR DER STRANDGRUNDEL POMATOSCHISTUS MICROPS K.),
Kiel Univ. (West Germany). Inst. fuer Meereskunde.
W. Tolksdorf.
Berichte der Deutschen Wissenschaftlicher Kommission fur Meeresforschung. Vol. 26, No. 1-2, p 15-29, 1978. 32 ref, 6 tab, 4 fig, In German with English Abstract.

Descriptors: *Salinity, *Water temperature, *Metabolism, *Adaptation, *Growth rates, *Feeding rates, Environmental effects, Fish physiology, Osmoregulation, Habitats, Temperature, Water properties, Laboratory tests, Lethal limit, Pomatoschistus, *Sand Gobies, *Osmoregulation.

Sand gobies Pomatoschistus microps were adapted to 4,5%, 9%, 13,5% and 18% salinity at 15C and 20C. Food intake, growth and metabolism were tested at adaptation temperature, further the reaction of metabolism was tested to continuously increased temperature up to 32C. Upper lethal temperature was determined by further continuously increased temperature. A long-term adaptation of P. microps to a salinity of 4.5% at 20C is not possible, but no problem was encountered in keeping the fish at other combinations of temperature and salinity. The lethal temperature for fish acclimated to 15C increases with increasing salinity from 4,5% to 13,5%. No special energy demand for osmoregulation could be determined. (EIS-Katz)
W79-02466

NET-AND NANOPLANKTON: EFFECTS OF AN OIL SPILL IN THE NORTH SEA,

Nordic Council for Marine Biology, Blomsterdalen (Norway).
C. Lannergren.
Botanica Marina, Vol. 21. p 353-356, 1978. 3 fig, 2 tab, 13 ref.

Descriptors: *Oil spills, *Nannoplankton, *Photosynthesis, Oil, Oil pollution, Biomass, Productivity, Diatoms, Trophic level, Offshore platforms, Herbivores, Phytoplankton, Toxicity, Growth rates, Water pollution effects, *Crude oil, *North Sea.

Following an oil spill in the North Sea carbon assimilation and biomass of phytoplankton were studied in three size fractions, greater than 30 micro m, 5-30 micro m, and less than 5 micro m. No harmful effects were detected; on the contrary the largest biomass and production occurred in the most contaminated water, containing about 260 ppb of petroleum hydrocarbons. The higher values were associated with the fraction greater than 30 micro m, presumably diatoms. It is uncertain if this was a direct effect, or the result of reduced grazing by herbivores in the presence of oil. (EIS-Deal)
W79-02467

THE NUTRIENT CONTENTS OF NORTH SEA WATER: CHANGES IN RECENT YEARS, PARTICULARLY IN THE SOUTHERN BIGHT,

Nederlands Inst. voor Onderzoek der Zee, Texel.
For primary bibliographic entry see Field 5B.
W79-02468

A MODEL OF THE BIOLOGICAL EFFECTS OF EUTROPHICATION IN THE NORTH SEA,

Danmarks Fishkeri- og Havundersogelser, Charlottenlund.
E. Ursin, and K. P. Andersen.
Rapports Et Proces-Verbaux Des Reunions Conseil International Pour L'Exploration De La Mer, Vol. 172, p 366-377, 1978. 4 tab, 14 ref.

Descriptors: *Mathematical models, *Phosphorus, *Nutrients, *Model studies, Eutrophication, Trophic level, Nutrient requirements, Ecosystems, Primary productivity, Phytoplankton, Aquatic populations, Municipal wastes, Sewage effluents, Commercial fish, Fish production, *North Sea.

In a model of the pathways of phosphorus through the North Sea ecosystem, first, a steady supply of nutrients from rivers, etc. was simulated, and next, an increasing supply. With apparently realistic data for water exchange and nutrient supply the model predicted a slight increase in the yield of fish, far from sufficient to describe the observed yield increase over the period 1960-1970. Recommendations for modification of several parameters of the model were offered. (EIS-Deal)
W79-02469

A METHOD OF PREDICTING THE BIOLOGICAL EFFECTS OF SYNTHETIC POLLUTANTS IN THE NORTH SEA,

Danmarks Fishkeri- og Havundersogelser, Charlottenlund.
H. Lassen.
Rapports Et Proces-Verbaux Des Reunions Conseil International Pour L'Exploration De La Mer, Vol. 172, p 378-383, 1978. 2 tab, 7 ref.

Descriptors: *Model studies, *Mathematical models, *DDT, *Polychlorinated biphenyls, Fish populations, Aquatic populations, Persistence, Pesticide kinetics, Pesticide residues, Organic compounds, Food webs, Productivity, Primary productivity, Trophic level, Fish reproduction, Mortality, Biomass, *North Sea, *Non-degradable compounds.

The ecomodel of Andersen and Ursin is extended to include a non-degradable chemical compound such as DDT or PCB. A simplified 'sea' holding four species is used to illustrate some features of the model. (EIS-Deal)
W79-02470

BLOOD CORPUSCLE RESISTANCE OF CARP DIED OF ENVIRONMENTAL HYPOXIA AND OF CYANIDE POISONING, (IN JAPANESE),

Hiroshima Univ. (Japan). Dept. of Fisheries.
S. Murachi, K. Nanba, and A. Hikite.
Journal of the Faculty of Fisheries and Animal Husbandry of Hiroshima University, Vol. 17, p 91-96, 1978. 5 fig, 2 tab, 10 ref.

Descriptors: *Fish diseases, *Mortality, *Toxicity, *Carp, Fish physiology, Cytological studies, Oxygen requirements, Poisons, Fishkill, Anaerobic conditions, Oxygen, *Hypoxia, Tissue analysis, *Cyanide, Red blood cells.

Blood corpuscle resistance (BCR) of carp was significantly lowered immediately after death by environmental hypoxia, while it remained at the same level as the normal one when the fish died of cyanide poisoning. However, 24 hours after the fish were dead, the BCR decreased in the case of death by cyanide poisoning, whereas it increased in the case of death by environmental hypoxia, when compared with its level immediately after death. The results indicate that the measurement of BCR of fish within several hours after death may be applicable in judging whether the cause of fish death was environmental hypoxia. (EIS-Deal)
W79-02471

EFFECTS OF BURIAL ON THE HEART COCKLE CLINOCARDIUM NUTTALLII AND THE DUNGENESS CRAB CANCER MAGISTER,

Fisheries and Marine Service, West Vancouver (British Columbia).
B. D. Chang, and C. D. Levings.
Estuarine and Coastal Marine Science, Vol. 7, p 409-412, 1978. 2 tab, 9 ref.

Descriptors: *Crabs, *Dredging, Animal behavior, Spoil banks, Mortality, Sand, Bottom sediments, Benthic fauna, *Waste disposal, Waste dump, Crustaceans, Environmental effects, *Mulluscs, *Heart cockle, Clinocardium, Dungrass crabs.

Burial experiments with dredge spoil sand were performed in the laboratory using heart cockle and the Dungegrass crab. All cockles buried by 5 cm or less re-established siphon contact with water in less than 24 h. Under 10 cm of sand, less than 50% reached the surface within 24 while none did so under 20 cm sand. All crabs reached the surface in less than 24 h burial by 10 cm or less of sand, while none did so under 20 cm. (EIS-Deal)
W79-02472

EFFECTS OF THERMAL DISCHARGES ON MORTALITY OF MERCENARIA MERCENARIA IN BARNEGAT BAY, NEW JERSEY,

Jersey Central Power and Light Co. Morristown, NJ. Environmental Affairs Dept.
M. J. Kennish.
Environmental Geology, Vol. 2, No. 4, p 223-254, 1978. 16 fig, 27 tab, 49 ref.

Descriptors: *Mollusks, *Mortality, *Thermal pollution, *Clams, Animal populations, Heated water, Water temperature, Growth rates, Life history studies, Seasonal, Animal physiology, Nuclear powerplants, Benthic fauna, Animal behavior, Growth stages, New Jersey, *Barnegat Bay(NJ).

Thermal discharges from the Oyster Creek Nuclear Generating Station do not affect mortality in natural populations of Mercenaria mercenaria in Barnegat Bay, New Jersey. The analyses of daily growth increments and disturbance bands in shell cross-sections of death assemblages of the pelecypods collected at the mouth of Oyster Creek (strongly affected by thermal discharges) and at three control sites (unaffected by thermal discharges) in the bay indicate that similar mortality patterns exist in all assemblages. This is revealed by mortality rate curve, survivorship curves, and life tables, which are nearly identical for each assemblage. (EIS-Deal)
W79-02473

ECO-BIOCHEMICAL STUDIES ON SOME ECONOMICALLY IMPORTANT INTERTIDAL ALGAE FROM PORT OKHA (INDIA),

Saurashta Univ., Rajkot (India). Dept. of Biosciences.
M. S. Murthy, and P. Radia.
Botanica Marina, Vol. 21, p 417-422, 1978. 7 fig, 12 ref.

Descriptors: *Marine algae, *Primary productivity, *Protein, Biochemistry, Ecosystems, Niches, Chemical analysis, Water temperature, Hydrogen ion concentration, Salinity, Cytological studies, Photosynthesis, Lipids, Carbohydrates, Sodium, Potassium, Calcium, Phosphorus, Metabolism, Aquiculture, Ulva, Gelidiella, Sargassum.

An attempt was made to study the biochemical contents of Ulva lactuca, Gelidiella acerosa, and Sargassum swartzii and to correlate them with ecological factors of the marine environment. There was a close relationship between the net primary productivity and protein content in S. swartzii. An inverse relation existed between crude fat and crude fibre content in all 3 algae studied. Factors like temperature, salinity, pH had no bearing on the different biochemical contents of the algae. Water deficiency due to more exposure and consequently increased light in the case of S. swartzii and G. acerosa enhanced fat formation. (EIS-Deal)
W79-02475

GROWTH-INFLUENCING SUBSTANCES IN SEDIMENT EXTRACTS FROM A SUBTROPICAL WETLAND: INVESTIGATION USING A DIATOM BIOASSAY,

Rosenstiel School of Marine and Atmospheric Science, Miami, FL. Div. of Biology and Living Resources.
K. E. Cooksey, and B. Cooksey.
Journal of Phycology, Vol. 14, p 347-352, 1978. 2 fig, 3 tab, 28 ref.

Descriptors: *Diatoms, *Growth rates, *Plant growth substances, *Mangrove swamps, *Bioassay, Inhibition, Inhibitors, Sediments, Seasonal, Organic compounds, Biochemistry, Metabolism, Plant physiology, Ecosystems, Wetlands, *Heterotrophy, *Mixotrophy, Amphora.

A biological assay using Amphora coffeaeformis perpusilla and A. coffeaeformis was used to investigate the changes in the properties of soluble organic carbon in sediments taken from a coastal wetland. During January to May, sediment extracts became increasingly inhibitory to diatom growth. After the onset of the spring rains, the inhibitory properties of the extracts disappeared. Substances capable of promoting mixotrophic growth and heterotrophic growth were found in extracts taken in July to December. These positive responses took place at the time of mangrove leaffall. (EIS-Deal)
W79-02476

EFFECT OF METHALLIBURE ON THE HYPOPHYSIS AND GONADAL DEVELOPMENT OF THE CICHLID FISH, TILAPIA MOSSAMBICA,

Niigata Univ. (Japan). Biological Lab.
A. Chiba, Y. Honma, and W. J. R. Lanzing.
Japanese Journal of Icthyology, Vol. 25, No. 2, p 107-114, 1978. 6 fig, 1 tab, 20 ref.

Descriptors: *Cichlids, *Fish reproduction, Growth stage, Growth rates, Inhibition, Reproduction, *Cytological studies, Juvenile growth, Toxicity, Fish physiology, Animal metabolism, Biochemistry, Bioassay, *Tilapia, Tissue analysis, *Methallibure, *Hypophysis, Hormones.

The present paper describes histological and cytological changes in the hypophysis and gonads of juvenile Tilapia mossambica exposed to the antigonadotropic drug methallibure. This treatment markedly inhibited the process of maturation of gametogenesis in both sexes, in addition to retardation of differentiation of interstitial cells and epithelial lining of the efferent duct of the testis. The

polygonal basophils (gonadotrophs) located in the ventral portion of the proximal pars distalis of the hypophysis underwent a marked decrease in cell size as well as in the amount of cytoplasmic granules of glycoproteinaceous nature. Atrophy was manifested by the acidophils (somatotrophs) of the proximal pars distalis and the PAS positive cells of the pars intermedia, whereas no appreciable change was recognized in other cell types of the adenohypophysis. (EIS-Deal)
W79-02477

DETERMINATION OF METHYLMERCURY IN FISH OF SOUTH CAROLINA,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
For primary bibliographic entry see Field 5A.
W79-02478

ORGANCHLORINES IN CODFISH FROM HARBOURS ALONG THE NORWEGIAN COAST,
Norges Veterinarhoegskole, Oslo. Dept. of Pharmacology and Toxicology.
E. M. Brevik, J. E. Bjerk, and N. J. Kveseth.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 715-720, 1978. 1 fig, 1 tab, 8 ref.

Descriptors: *Polychlorinated biphenyls, *DDT, *Pesticide residues, Industrial wastes, Fungicides, Insecticides, Chlorinated Hydrocarbon pesticides, Pesticide kinetics, Chemical analysis, Water analysis, Chemical wastes, Path of pollutants, Orgaic compounds, Commercial, Fish, *Organochlorines, Tissue analysis, *Bioaccumulation, *Cod, *Hexachlorobenzene(HCB), *Norway, Oslo Fjord, Burgen Kristiansand.

Levels of PCBs, HCB and sum-DDT found in codfish liver obtained near the harbours of several towns located along the coast of Norway, are generally low. The degree of contamination appeared to be somewhat higher in the Oslo fjord area than at the other sampling sites. Exceptions to this general picture were Bergen (high levels of sum-DDT and PCBs) and Kristiansand harbour (high levels of HCB). (EIS-Deal)
W79-02479

EFFECT OF HEXACHLOROBENZENE (HCB) ON PHOTOSYNTHETIC OXYGEN EVOLUTION AND RESPIRATION OF CHLORELLA PYRENOIDOSA,
Biologische Bundesanstalt fuer Land- und Forstwirtschaft, Berlin (West Germany). Inst. fuer Nichtparasitare Pflanzenkrankheiten.
F. Geike, and C. D. Parasher.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 647-651, 1978. 1 fig, 1 tab, 6 ref.

Descriptors: *Chlorella, *Photosynthesis, *Respiration, *Toxicity, Chlorophyta, Algae, Oxygen, Metabolism, Inhibition, Organic compounds, Persistence, Cytological studies, Chemical properties, *Hexachlorobenzene(HCB).

In experiments with Chlorella pyrenoidosa it was shown than an exposure of these cells to HCB at a dose level of 0.1, 1.0, and 5.0 ppm caused an inhibition of photosynthetic oxygen evolution of 33.3, 42, and 51%, respectively. Respiration, however, was inhibited only slightly, if at all. (EIS-Deal)
W79-02480

THE EFFECT OF SILT-FENCE ON THE PREVENTION OF SEA WATER SILTATION CAUSED BY DREDGING AND RECLAIMING WORK IN HARBOR, (IN JAPANESE),
Hokkaido Regional Fisheries Research Lab. (Japan).
Y. Sato.
Bulletin of the Holkaido Regional Fisheries Research Laboratory, No. 43, p 53-57, 1978. 1 fig, 2 tab, 6 ref.

Descriptors: *Dredging, *Suspended solids, *Silts, Channel improvement, Sea water, Salinity, Turbidity, *Waste disposal, Waste dumps, Solid wastes, Water pollution sources, Reclamation, *silt-fence, *Iwanai Harbor(Japan).

The use of silt-fence seemed to be highly efficient in the prevention of dispersion of the drain from the dredging and reclaiming work in Iwanai harbor (Japan). It was pointed out that caution is necessary in dealing with the re-deposit inside the silt-fence. (EIS-Deal)
W79-02481

THE POLLUTION OF SEA-WATER IN NAGASAKI BAY IN SUMMER 1976 AND 1977, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5B.
W79-02482

MICROORGANISMS AND HEAVY METAL TOXICITY,
University Coll., Cardiff (Wales). Dept. of Microbiology.
G. M. Gadd, and A. J. Griffiths.
Microbial Ecology, Vol. 4, p 303-317, 1978. 120 ref.

Descriptors: *Heavy metal, *Toxicity, *Microorganisms, *Microbiology, Physiology, Metabolism, Resistance, Chemical properties, Chemical reactions, Biochemistry, Ions, Cytological studies, Genetics, Adaptation, Bacteria, *Mercury, *Cadmium, Microbial degradation, Fungi, Chemical degradation, Absorption, Nickel, Cobalt, Zinc, Manganese, Magnesium, Calcium, Biotransformation, Bioaccumulation, *Methylmercury, *Detoxification.

The environmental and microbiological factors that can influence heavy metal toxicity are discussed with a view to understanding the mechanisms of microbial metal tolerance. It is apparent that metal toxicity can be heavily influenced by environmental conditions. Binding of metals to organic materials, precipitation, complexation, and ionic interactions are all important phenomena that must be considered carefully in laboratory and field studies. It is also obvious that microbes posses a range of tolerance mechanisms, most featuring some kind of detoxification. Many of these detoxification mechanisms occur widely in the microbial world and are not only specific to microbes growing in metal-contaminated environments. (EIS-Deal)
W79-02483

EFFECT OF BARITE (BASO4) ON DEVELOPMENT OF ESTUARINE COMMUNITIES,
Environmental Research Lab., Gulf Breeze, FL.
M. E. Tagatz, and M. Tobia.
Estuarine and Coastal Marine Science, Vol. 7, p 401-407, 1978. 1 fig, 3 tab, 11 ref.

Descriptors: *Oil wells, *Toxicity, *Drilling fluids, *Mud., *Biological communities, Drilling, Sulfates, Estuaries, Plankton, Sand, Larval growth stage, Annelids, Mollusks, Growth rates, Clams, Benthic fauna, *Barite, *Barium compounds.

Barite, the primary component of oil drilling muds, affected the composition of estuarine communities developed from planktonic larvae in aquaria containing sand and flowing estuarine water. Annelids were particularly affected and significantly fewer were found in all treatments than in the control. Mollusks decreased markedly in number only in barite-covered aquaria. Barite, however, did not impede growth of the abundant clam, Laevicardium mortoni, or decrease abundance of six other phyla. Our data indicate that large quantities of this compound, as discharged in offshore oil drilling possibly could adversely affect the colonization of benthic animals. (EIS-Deal)
W79-02484

THE EFFECTS OF PETROLEUM ON THE SALT MARSH ECOSYSTEM,
College of William and Mary, Williamsburg, VA. Dept. of Marine Sciences.
J. L. Lake.
PhD Dissertation, 1977. 137 p.

Descriptors: *Salt marshes, *Oil, *Water pollution effects, *Marsh plants, *Aquatic animals, Wetlands, Coastal marshes, Morbidity, Water pollution, Environmental effects, Pollutants, Sediments, Organic compounds.

The research examines the effects of chronic, low level oil pollution on salt marsh ecosystems. Two marshes were dosed monthly with No. 2 fuel oil while a third served as a control. In the first marsh the distribution and incorporation of oil into Spartina alterniflora and sediments were determined. Examination of the alkane fraction extracted from the sediment showed a decrease in the concentrations of n-alkanes relative to that of the isoprenoids, pristane, and phytane, eight to nineteen weeks after the final oil dosing. The most significant consequence of the low level dosing was the damage to the S. alterniflora. Loss of grass production due to the oiling was estimated at 52.5%. Plant mortality resulted in extensive erosion of the underlying peat and sediment in areas of oil accumulation. Recovery has been slow. The second marsh was examined in terms of the accumulation, retention, and in situ depuration of petroleum compounds by four marsh organisms: Modiolus demissus, Crassostrea virginica, Littorina irrorata, and Nereis succinea. Except for the saturates of Littorina irrorata, the organisms rapidly depurated the petroleum compounds which they had accumulated during dosing. However, it appears that some organisms accumulated or selectively retained some aromatic hydrocarbons during depuration. (Steiner-Mass)
W79-02485

DIFFERENTIAL ELIMINATION OF PHENOL BY DIATOMS AND OTHER UNICELLULAR ALGAE FROM LOW CONCENTRATIONS,
Marburg Univ. (West Germany). Gachbereich Biologie.
D. Werner, and H. Pawlitz.
Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 303-312, No. 3, 1978. 8 fig, 23 ref.

Descriptors: *Phenols, *Metabolism, *Diatoms, *Algae, *Absorption, Chlamydomonas, Chlorella, Euglena, Scenedesmus, Path of pollutants, Bioindicators, Growth rates, Chemical properties, Biodegradation, Phytoplankton.

The comparative efficiency of several unicellular algae at eliminating phenol was examined. The uptake and elimination kinetics were reported for each of the 11 organisms studied. Anacystis, Euglena, Chlorella, and Scenedesmus were the most efficient strains. (EIS-Deal)
W79-02486

INSECTICIDE PERSISTENCE IN NATURAL SEAWATER AS AFFECTED BY SALINITY, TEMPERATURE, AND STERILITY,
Gulf Coast Research Lab., Ocean Springs, MS. Microbiology Section.
For primary bibliographic entry see Field 5B.
W79-02487

ETHYLMERCURY: FORMATION IN PLANT TISSUES AND RELATION TO METHYLMERCURY FORMATION,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5A.
W79-02488

STUDIES ON THE EFFECTS OF THE ENVIRONMENT ON THE HEART RATE OF SHELLFISHES. II. EFFECTS OF TEMPERATURE, LOW SALINITY AND HYPOXIA ON THE HEART RATE OF AN ABALONE HALIO-

TIS (NORDOTIS) DISCUS HANNAI INO. (IN JAPANESE),
Hokkaido Regional Fisheries Research Lab. (Japan).
T. Nakanishi.
Bulletin of the Hokkaido Regional Fisheries Research Laboratory, No. 43, p 59-68, 1978. 7 fig, 5 ref.

Descriptors: *Animal physiology, *Water temperature, *Salinity, *Oxygenation, Oxygen, Oxygen requirements, Toxicity, Mortality, Shellfish, Commercial shellfish, Heated water, Sea water, *Abalone, Heart rate.

The effect of temperature on the heart rate was studied at eight temperatures from -1.8C to 33C at 5 degree intervals. At the highest and lowest temperatures every abalone died. In general, heart rate increased with temperature, reaching a maximum rate at 28C. When the effect of salinity was examined it was noted that heart rate decreased with salinity. As for the effect of oxygen saturation, above 30% the heart rate increased, while below 30% it decreased. (See also W77-11265) (EIS-Katz)
W79-02497

EFFECTS OF INGESTING MERCURY-CONTAINING BACTERIA ON MERCURY TOLERANCE AND GROWTH RATES OF CILIATES,
Maryland Univ., College Park. Dept. of Microbiology.
S. G. Berk, A. L. Mills, D. L. Hendricks, and R. R. Colwell.
Microbial Ecology, Vol. 4, p 319-330, 1978. 2 fig, 5 tab, 26 ref.

Descriptors: *Protozoa, *Mercury, *Resistance, *Adaptation, Bacteria, Mortality, Evolution, Growth rates, Heavy metals, Toxicity, Animal populations, Pseudomonas, Chesapeake Bay, Food chains, Path of pollutants, Uronema.

The ciliate Uronema nigricans was found to acquire tolerance to mercury after being fed mercury-laden bacteria followed by exposure of washed suspensions of these ciliates to various concentrations of mercury in solution. Significant differences in percent mortality were observed for ciliates fed mercury-laden bacteria compared with control suspensions fed mercury-free bacteria. The phenomenon of acquired mercury tolerance was demonstrated within a single generation time. The effect of ingesting mercury-laden bacteria on growth rate of Uronema was examined, and results showed no significant differences in growth rates of 3- and 14-day-old cultures of protozoa that had been fed mercury-laden and mercury-free bacteria under controlled conditions. (EIS-Deal)
W79-02499

THE URQUIOLA OIL SPILL, LA CORUNA, SPAIN: IMPACT AND REACTION ON BEACHES AND ROCKY COASTS,
South Carolina Univ., Columbia. Dept. of Geology.
E. R. Gundlach, C. H. Ruby, M. O. Hayes, and A. E. Blount.
Environmental Geology, Vol 2, No 3, p 131-143, 1978. 14 fig, 1 tab, 14 ref.

Descriptors: *Oil spills, *Beaches, *Coasts, Oil, Oil pollution, Sands, Particle size, Waves(Water), Tides, Path of pollutants, Water pollution effects, Sediments, *Crude oil, *Spain, Tanker Urquila, Rocky coasts.

The impact and interaction of oil on fine-sand, coarse-sand, and gravel beaches and on sheltered and exposed rocky coasts was monitored in detail. The surficial distribution of oil on the beaches was influenced primarily by wave activity, tidal stage, and oil quantity. Heaviest accumulations formed along the high-tide swash line. Within beach sediments, oil was present at distinct oiled sediment layers, which were often deeply buried. The depth of burial was related to wave energy and sediment type. The thickness of oiled sediment depended on sedimentary characteristics, the quantity of oil present, and wave action and capillary forces. (EIS-Deal)
W79-02500

5D. Waste Treatment Processes

A SURVEY OF PHOSPHORUS AND NITROGEN LEVELS IN TREATED MUNICIPAL WASTEWATER,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5A.
W79-02003

EPA'S CONSTRUCTION GRANTS PROGRAM: PERSPECTIVES COSTS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-02027

ECONOMIC EVALUATION OF FOUR SLUDGE DEWATERING DEVICES,
T. Viraraghavan, and R. C. Landine.
Pollution Engineering, Vol 10, No 9, p 55-57, Sept 78. 5 fig, 2 tab.

Descriptors: *Sludge treatment, *Dewatering, *Waste water treatment, Equipment, *Alternative costs, *Sludge disposal, Alternative planning, Decision making, Economics, Evaluations, Canada, New Brunswick(Canada), Vacuum filters, Centrifugation, Filter presses, Belt filter presses, Filters, Filtration, Technology, Cost-effectiveness.

Four sludge dewatering methods (vacuum filter, centrifuge, filter press, and belt filter press) were evaluated in terms of technology and economics for use in a proposed municipal wastewater treatment plant in New Brunswick, Canada. The sludge treatment system consists of thickening a mixture of primary and secondary sludge, chemical conditioning, dewatering by one of the four mechanical dewatering units, and ultimate disposal in a landfill. Preliminary economic evaluation (total costs) showed that centrifuges ($46-65/ton dry solids) and belt filter presses ($45-63/ton dry solids) are both cost-effective for the case studied. Filter presses are most expensive ($80-100/ton dry solids), followed by vacuum filters ($58-68/ton dry solids). While the vacuum filter system had the lowest total capital costs ($95,700), the annual operation and maintenance costs of the belt filter press ($29,000) and centrifuge ($34,600) were considerably lower than the other two options. Capital costs for the other three systems ranged from $109,800 to $139,400; annual operating costs were $46,400 for vacuum filters and $61,400 for filter presses. (Lynch-Wisconsin)
W79-02037

COORDINATING PUBLIC UTILITY EXPANSION, INDUSTRIAL SITING AND POLLUTION CONTROL: A WORKING DYNAMIC PROGRAMMING ALGORITHM,
California Univ., Riverside. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-02039

NEW PULP MILL STRIKES LOW PROFILE.
Chemical Week, Vol. 122, No. 26, p 37, June 28, 1978.

Descriptors: *Waste water treatment, *Pulp wastes, *Treatment facilities, *Maine, *Kraft mills, Pulp and paper industry, Water pollution treatment, Water pollution sources, Waste treatment, Wastes, Industrial wastes, Activated sludge, Aerated lagoons, Recovery furnace, Chemical recovery, Spill collection, Odor control, Burning, Boilers, Lime kilns.

The $35,000,000 environmental control system at the 800-ton/day kraft mill of Scott Paper Co. in Somerset, Maine includes a 25,000,000 gal/day activated-sludge treatment system that features two 8-acre aeration ponds, a recovery furnace equipped with a Koppers electrostatic precipitator, and a complex spill-collection system that can store and recover concentrated wastes that may enter the plant's sewer system. All possible odor sources are hooded, and the gases are collected for burning in either a hog boiler or a lime kiln. (Swichtenberg-IPC)
W79-02102

THE OCCURRENCE AND REMOVAL OF NITROGEN IN SUBSURFACE AGRICULTURAL DRAINAGE FROM THE SAN JOAQUIN VALLEY, CALIFORNIA,
California Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W79-02107

COMBINATION LIMESTONE-LIME NEUTRALIZATION OF FERROUS IRON ACID MINE DRAINAGE,
Industrial Environmental Research Lab., Cinncinnati, OH.
R. C. Wilmoth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 169, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/2-78-002, January 1978. 60 p, 10 fig, 18 tab, 6 ref.

Descriptors: *Acid mine water *Acid base equilibrium, *Mine drainage, *Limestone, *Sludge treatment, Chemical reactions, Neutralization, Ferrous iron, West Virginia, Lime, Cost-benefit analysis, Calcium hydroxides.

Results of studies conducted to evaluate combination limestone-lime treatment of ferrous iron acid mine drainage (AMD) are presented. Treatment was by a two-step neutralization process, whereby rock-dust limestone was mixed with the influent AMD and then hydrated lime was added in a polishing reactor. Combination first-stage limestone and second stage lime treatment of the AMD resulted in better than 30% reduction in reagent usage cost as compared to single-stage hydrated lime treatment of the same AMD. An equal cost reduction (compared to single-stage lime treatment) when a two-stage hydrated lime process in which the AMD and the recycled sludge were mixed in the first reaction vessel and hydrated lime was added to the second reactor. In situations where sludge was not recycled no cost advantage appeared to exist. (Davison-IPA)
W79-02150

THE CHARACTERIZATION OF BACILLUS CAPABLE OF BLUE-GREEN BACTERICIDAL ACTIVITY,
Delaware Univ., Newark. Dept. of Biological Sciences.
R. L. Reim, M. S. Shane, and R. E. Cannon.
Canadian Journal of Microbiology, Vol. 20, p 981-986, March 18, 1974. 3 fig, 3 tab, 13 ref. OWRT A-016-DEL(6).

Descriptors: *Cyanophyta, *Bactericides, *Bacteria, Biocontrol, Oxidation ponds, Viruses, *Bacillus brevis, Antibacterial activity, *Lysogeny.

A gram-negative, aerobic, spore-forming Bacillus isolated from a sewage oxidation pond was found to have a lytic effect on a wide variety of blue-green bacteria and on several bacteria, including other bacilli. The isolate, designated 247, has been identified as an atypical Bacillus brevis. The lytic activity was found in the culture filtrate and was produced during the stationary phase of growth. When the culture filtrate was applied to the interaction between plectonema boryanum ad LPP-cyanophages, it facilitated the establishment of lysogeny by these viruses. (Heson - Delaware)
W79-02159

INVOLVEMENT OF FREE RADICALS IN THE AQUEOUS-PHASE CATALYTIC OXIDATION OF PHENOL OVER COPPER OXIDE,
Delaware Univ., Newark. Dept. of Chemical Engineering.

A. J. Sadana, and J. R. Katzer.
Journal of Catalysis, Vol 35, p 140-152, (1974). 7 fig, 47 ref. OWRT A-027-DEL(2).

Descriptors: Oxidation, Catalysts, Chemical reactions, Phenols, Kinetics, Industrial wastes, *Waste water treatment, Ultimate disposal, Chemical wastes, Free radicals, Catalytic oxidation, Aqueous-Phase oxidation.

Aqueous-phase of phenol over copper oxide was studied between 369-393 degrees K and 1-17 atm oxygen pressure in batchwise mode. The reaction involves an induction period and a steady-state activity regime. The initial rate is first order in phenol and oxygen, but the rate is one-half order in oxygen in the steady-state activity regime. Heterogeneously catalyzed aqueous-phase phenol oxidation occurs by a free-radical mechanism which involves initiation on the catalyst surface, homogeneous propagation and either predominantly homogeneous or heterogeneous termination depending on catalyst concentration. That a free-radical mechanism is involved is indicated by the induction period, by the observed reaction kinetics, by free-radical inhibitor studies which show the same inhibitor efficiencies as observed in free-radical oxidation and by pH studies. The involvement of a heterogeneous-homogeneous raction mechanism is indicated by dependence of the reaction rate on catalyst concentration.
W79-02166

BARK AS A MEDIUM FOR GRAVITY DEWATERING OF SECONDARY SLUDGE FROM PULP AND PAPER MILLS,
Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
G. R. Lightsey, and W. B. Hall.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 699 Price codes: A03 in paper copy. Water Resources Research Institute, Mississippi State University, Report, October 1978. 28 p, 13 fig, 3 tab, 11 ref. OWRT A-117-MISS(1), 14-34-0001-8026.

Descriptors: *Secondary sludge dewatering, *Dual media filters, *Pulp and paper mill sludge, *Sludge dewatering, Suspended solids, Settleable solids, Biological wastes, Sludge treatment, *Bark filters, *Secondary sludge, Pulp and paper mills.

The objective was to evaluate the use of bark filters for gravity dewatering of secondary sludge from pulp and paper mills. Samples of secondary sludge were collected from various pulp and paper mills and passed through filtering beds containing both hogged and unhogged softwood barks. The characteristics of the sludges were measured both before and after gravity dewatering on the bark filters. Due to frequent clogging of flow control mechanism a declining flow rate mode was used. Significant reductions in settleable solids and in total solids were achieved only in filters containing bark that had passed through an 1/8 inch screen. Moderate reductions in settleable and total solids were found with filters containing bark passing 1/4 inch caught on 1/8 inch screen. Larger bark sizes gave little filtering action. Bark filters, if blinding were reduced, could be used effectively to dewater secondary sludge.
W79-02186

MINNESOTA'S PEAT RESOURCES: THEIR CHARACTERISTICS AND USE IN SEWAGE TREATMENT, AGRICULTURE, AND ENERGY,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W79-02255

ECONOMIC IMPACT OF ALTERNATIVE STORMWATER DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Economics.
L. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 797, Price codes: A04 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center Technical Report No. 111. November 1978. 48 p, 3 fig, 18 tab, 20 ref, 3 append. OWRT C-6106 (No. 5213)(6).

Descriptors: *Urban drainage, *Drainage systems, *Detention reservoirs, *Cost analysis, Storm runoff, Storm drains, Urban hydrology, Surface drainage, Pipelines, Detention, Storage requirements, *Detention storage.

Economic comparisons are made of 15 urban drainage designs considering combinations of open channel, pipe, and detention storage. Emphasis was placed on detention storage in order to permit evaluation of the detention storage with relation to different scales of treatment plants. The systems were designed for a 1,912 acre watershed in West Lafayette, Indiana. Complete pipeline systems with no open channels that have detention storage were more costly than pipelines without detention storage. Detention storage is more costly than pipeline alone even when the storage is a low grass area in a recreational park rather than a concrete lined facility. A single large volume detention facility is less costly than multiple facilities. With very large volumes of detention storage the number of facilities has strong interaction with the location of the facility, hence the economically least expensive system is a joint function of size, number and location. (Wiersma-Purdue)
W79-02289

AN ECONOMIC APPROACH TO WATER SUPPLY PLANNING IN SOUTHEASTERN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. VA. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-02294

INVESTIGATIONS OF HEAT TREATMENT FOR PAPER MILL SLUDGE CONDITIONING,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, MI. Central-Lake STates Regional Center.
For primary bibliographic entry see Field 5E.
W79-02296

WINERY WASTEWATER CHARACTERISTICS AND TREATMENT,
French (R. T.) Co., Shelley, ID.
K. L. Sirrine, P. H. Russell, Jr., and J. Makepeace.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 932, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/2-77-102, June 1977. 76p, 24 fig, 8 tab, 5 ref, 1 append.

Descriptors: *Food processing industry, *Activated sludge, *Treatment facilities, *Pilot plants, *Nutrient requirements, Industrial wastes, Aerobic treatment, Tertiary treatment, Waste water treatment, Winery wastes, Grape processing.

The characteristics of winery waste water and methods of treatment were investigated at the Widmer Wine Cellars in Naples, New York. Design factors related to grape processing and effluent requirements are discussed. Since wine making includes a grape pressing phase and a processing phase, waste water characteristics are given for both seasons. An interceptor sewer and a waste water treatment facility which included an entrance structure, aeration units, a final clarifier, a tertiary sand filter, and an aerobic digester were constructed as part of the study. The facilities were used to study the effects of variable food-to-microorganism ratios, establish the reaction rate for winery waste water, and to examine nutrient and neutralization needs. Operation of the facility indicated that long-term activated sludge processes followed by tertiary sand filtration were capable of reducing influent BOD of 1370 mg/liter and solids concentrations of 182 mg/liter by 96%. Freezing temperatures during the winter hindered operations of the aeration basins, clarifier, and diverter boxes. Additions of nitrogen and phosphorus to provide a BOD:N:P ratio of 100:5:1 were required to insure proper sludge formation, treatment, and settling. Reaction rate constants determined by the study were 0.0066 at 20C for the pressing season and 0.022 at 20C for the processing season. Construction and operating costs are presented for the facility. (Schultz-FIRL)
W79-02297

CHARACTERIZATION AND IN-PLANT REDUCTION OF WASTEWATER FROM HOG SLAUGHTERING OPERATIONS,
Wisconsin Univ.-Madison.
P. M. Berthouex, D. L. Grothman, D. O. Dencker, and L. J. P. Scully.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 091, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/2-77-097, May 1977. 171 p, 38 fig, 27 tab, 3 ref, 5 append.

Descriptors: *Food processing industry, *Hogs, *Treatment facilities, *Water utilization, *Water conservation, Industrial wastes, Costs, On-site data collections, Organic wastes, Organic loading, Waste water treatment, Hog slaughtering wastes, Meat packing wastes.

The character and quantity of wastes generated in a typical hog slaughtering operation were examined at Oscar Mayer plants in Madison, Wisconsin; Beardstown, Illinois; and Davenport, Iowa. Hog slaughter and carcass handling operations at the facilities are described. Waste water characteristics presented for the production shift, cleanup shift, and total hog kill floor effluent include total solids, suspended solids, volatile solids fractions, COD, total Kjeldahl nitrogen, total organic carbon, BOD, and grease. Waste water collection and treatment systems at the three facilities are examined. Process modifications to reduce the waste water flow and pollution load are evaluated. Process changes in the stick and bleed area, the scald tank, the dehairing area, the rail polisher, the carcass shower, the carcass work-up area, the evisceration treadmill and viscera pans, the hasher-washer, the stomach washer, the neck washer, and the chitterling washer resulted in annual savings of up to $129,000 above the cost of the modification. A strategy for in-plant studies to reduce waste water production is presented. (Schulz-FIRL)
W79-02298

OZONE TREATMENT OF CYANIDE-BEARING PLATING WASTE,
PCI Ozone Corp., West Caldwell, NJ.
L. J. Bollyky.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 015, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-77-104, June 1977. 51 p, 2 fig, 17 tab, 21 ref.

Descriptors: *Ozone, *Cyanide, *Electronic equipment, *Separation techniques, *Oxidation, Pilot plants, Chemical wastes, Industrial wastes, Metals, Copper, Gold, Silver, Waste water treatment, Electroplating wastes.

A study was conducted to evaluate the use of ozone to treat cyanide wastes from electroplating processes as an alternative to conventional chemical treatment methods. Full-scale studies were conducted in Wichita, Kansas, at Sealectro Corporation, an electronics manufacturing plant which uses copper, gold, and silver plating in its operations. Acidic metal wastes and alkaline cyanide waste streams are collected separately and can be stored in underground equalization tanks. The treatment system also includes a PCI Model G-20-M Ozone Generator, a pH control system, an ozone reactor, a caustic tank, a flash mixer, and a settling tank. Studies on the effects of changes in process parameters indicated that the optimum process parameters for the Sealectro plating waste treatment plant were an ozone dosage of 1-1.5 mole O3/mole CN(-) or 1.85-2.8 mg/liter O3 per mg/liter; a pH of 7.5-9.5 for the cyanide waste; a pH of 9.0-9.5 for the final treated effluent in the settling tank; and ambient temperatures of 14-20 C. Cyanides and cyanates were destroyed by oxidation, and copper and silver were removed as oxides during the

treatment process. Capital costs for the system were $66,613 in 1973 and operating costs were $55.50/day. Treatment costs were $29.88/day for total CN removal with a total treatment cost of $73.26/day. (See also W77-08638) (Schulz-FIRL)
W79-02299

NEW MEMBRANES FOR TREATING METAL FINISHING EFFLUENTS BY REVERSE OSMOSIS,
Midwest Research Inst., Minneapolis, MN.
R. J. Peterson, and K. E. Cobian.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 363, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-76-197, October 1976. 69 p, 15 fig, 13 tab, 23 ref, 3 append.

Descriptors: *Membrane processes, *Reverse osmosis, *Copper, *Zinc, *Polymers, Filtration, Metals, Industrial wastes, Acidic water, Waste water treatment, Design data, Electroplating wastes, Cyanides, Membrane performance.

The NS-100 membrane, consisting of a polyurea layer created by the reaction of tolyene diisocyanate with polyethylenimine and deposited on a porous polysulfone support film, was evaluated for use in reverse osmosis treatment of electroplating wastes. Objectives of the program include the modification of the fabrication process for NS-100 tubular reverse osmosis membranes for optimum performance with metal finishing wastes, the demonstration of long-term usage of NS-100 membranes with acid and alkaline rinse waters, and the design of a field demonstration unit. Fabrication procedures for the polymers and the tube cast membranes are presented. Design data and testing procedures for the pilot-scale reverse osmosis test loop used in the evaluation are presented. Tests included 2360 hours of continuous operation with 1.27-cm tubular membranes, half at pH 1.2 (acid copper) and half at pH 12.8 (zinc cyanide). Membrane rejections were greater than 99% for copper and zinc, and greater than 96% for cyanide. Membrane fluxes for the acid copper solution were 18-24 liters/sq m/hr but only 8-15 liters/sq m/hr for the zinc cyanide solution. Two experimental membranes produced with isophthaloyl chloride instead of tolyene diisocyanate performed well with zinc rejections of 98.5% but only exhibited cyanide rejections of 90%. Reproducibility of the procedure for tubular NS-100 membranes was inadequate, since membranes which were fabricated at the beginning of the study had high permeate fluxes while membranes produced later had low fluxes and high salt rejections. (Schulz-FIRL)
W79-02300

TREATMENT OF HIGH STRENGTH MEAT-PACKING PLANT WASTEWATER BY LAND APPLICATION,
Texas Univ. at Paso. Dept. of Civil Engineering.
A. J. Tarquin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 582, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/2-76-302, December 1976. 49 p, 11 fig, 6 tab, 14 ref.

Descriptors: *Food processing industry, *Return flow, *Nutrient removal, *Irrigation practices, Grasses, Waste water disposal, Nitrogen, Chemical oxygen demand, Infiltration, Fescues, Organic loading, Industrial wastes, Waste water treatment, *Meatpacking wastes.

The treatment of high-strength meatpacking plant waste water by land application was investigated in pilot studies at the Peyton slaughterhouse/meatpacking plant in El Paso, Texas. Laboratory studies were conducted to examine the plant's waste water characteristics and to determine the most appropriate type of soil cover for planting in the application areas. Overland flow systems and infiltration with high-pressure and low-pressure systems at various hydraulic and organic loading rates were the two types of land application considered. Design data for the application systems are presented. Once growth was established with regular irrigation, two warm season grasses (Bermuda NK-37 and Blue Panicum) and two cool season grasses (Kentucky-31 Tall Fescue and Jose Wheatgrass) were irrigated with the meatpacking plant waste water. Studies with the infiltration systems indicated that raw waste water COD of 9400 mg/liter could be reduced by 99% at an application rate of 10 cm/week. COD removal by the overland flow system was 84% and improved with 'aging' of the application site. Nitrogen removal by the infiltration system was 72% at an application rate of 6.3 cm/week and 58% at 10 cm/week. Nitrogen removal by overland flow treatment was 44%. Aerosol drift was lower with the low-pressure infiltration system than with the high-pressure system. Further studies on waste segregation, nitrogen removal, hazards posed by pathogenic bacteria, and full-scale land application of meatpacking plant waste waters are recommended. (Schulz-FIRL)
W79-02301

LIMESTONE AND LIME NEUTRALIZATION OF FERROUS IRON ACID MINE DRAINAGE,
Environmental Protection Agency, Rivesville, WV. Resource Extraction and Handling Div.
R. C. Wilmoth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 911, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-77-101, May 1977. 105 p, 22 fig, 34 tab, 19 ref.

Descriptors: *Mine drainage, *Acid mine water, *Neutralization, *Limestones, *Lime, Pilot plants, Treatment facilities, Cost comparisons, Hydrogen ion concentration, Industrial wastes, Waste water treatment.

Results of a two-year study on the treatment of ferrous-iron-containing acid mine drainage with hydrate lime and rock-dust limestone neutralization are presented. The EPA neutralization facility at the Crown Mine Drainage Control Field Site near Morgantown, West Virginia, contained two parallel treatment trains in which acid mine drainage could be cycled from the turbine flow meter into: (1) a lime reactor, an aerator, and a thickener; (2) a limestone reactor, an aerator, and a thickener; or (3) a limestone reactor, a lime reactor, an aerator, and a thickener. Limestone neutralization was investigated as an alternative to lime treatment because of its cheaper costs and low-volume, high-density sludge. With limestone treatment, most effective neutralization was at a 20% sludge recycle rate, a pH value near 7, a 30-min detention time with vigorous mixing in the reactor, 4-6 hours detention in the aeration system, and the addition of coagulants at a 7 mg/liter rate. Lime treatment involved a 7-min reaction time, less than a 2-hr oxidation time, and a coagulant addition of 5 mg/liter. Although the limestone process was effective under certain conditions, the process was considered infeasible for general application to acid mine water containing more than 50 mg/liter of ferrous iron. (Schulz-FIRL)
W79-02302

HANDLING AND DISPOSAL OF SLUDGES FROM COMBINED SEWER OVERFLOW TREATMENT. PHASE II - IMPACT ASSESSMENT,
Envirex, Inc., Milwaukee, WI. Environmental Sciences Div.
K. R. Huibregtse, G. R. Morris, A. Geinopolos, and M. J. Clark.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 309, Price codes: A09 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/2-77-0536, December 1977. 197 p, 53 tab, 30 fig. 68-03-0242.

Descriptors: *Sewage disposal, *Sewage treatment, *Combined sewers, *Overflow, Estimated costs, Dewatering, Waste water treatment, Storm water, *Sludge disposal, *Water quality standards, Biochemical oxygen demand, Biological treatment processes, Precipitation, Organic loading, Dry weather plant sludge, Gravity thickening, Lime stabilization.

Increasing urbanization, economic expansion and water demands are contributing to the combined sewer overflow problem in the U.S. More than 1300 U.S. communities serving 36.2 million people have combined sewer systems which provide one collection system for both sanitary sewage and stormwater runoff. The discharge of these overflows during and after heavy rains is an important source of water pollution. The objective of this report is to attempt a rough quantification of the effort the U.S. will have to exert in the future, in the area of sludge handling and disposal, if full-scale treatment of combined sewer overflows (CSO) is to become a reality. Assuming an equal mix of various waste water treatment methods, an average yearly sludge volume resulting from treatment of all CSO nationwide would amount to 156.8x10 to the sixth power cu m (41.45x 10 to the ninth power gal) or 2.8% of total volume treated. Preliminary economic evaluation indicated that possible grit removing, lime stabilization, storage, gravity thickening, and land application or land fill were the most cost-effective treatment systems. Costs for overall CSO sludge handling would be dependent on the type of CSO treatment process and other considerations. Estimates indicate that initial capital costs would range from $447-10,173/ha ($181-4129/ac) with annual costs of $139-1630/ha ($56-660/ac). (See also W78-05987) (Coan-NC)
W79-02303

METHOD AND APPARATUS FOR REMOVING GRIT,
Ecodyne Corp., Lincolnshire, IL. (Assignee).
F. G. Weis.
U.S. Patent No. 4,107,038, 5 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1246, August 15, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Separation techniques, Settling basins, Flow, Flow characteristics, Flow around objects, Suspended solids.

Grit is removed from liquid sewage by flowing such sewage into a settling chamber and causing the sewage to flow in a toroidal pattern around the periphery of the chamber. Grit falls to the floor of the settling chamber and passes radially to and then through a central opening into a grit collection chamber. Organic solids are kept in motion in the toroidal flow pattern, or lifted from the settling chamber floor and are discharged through an outlet adjacent the upper surface of the liquid in the settling chamber. Toroidal flow is created and maintained by obstructing the tangential flow path of incoming sewage with a baffle which blocks the inlet and has an edge extending above the upper surface of the liquid. A propeller rotating about a vertical axis in the center of the chamber is adjustable so as to keep the contents of the chamber impinging against the baffle as they flow around the tank in the toroidal pattern. (Sinha-OEIS)
W79-02305

METHOD OF AND APPARATUS FOR PURIFYING FLUIDS WITH RADIOACTIVE IMPURITIES,
Epicor, Inc., Linden, NJ. (Assignee).
J. A. Levendusky.
U.S. Patent No. 4,107,044, 7 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1249, August 15, 1978.

Descriptors: *Patents, *Waste water treatment, *Radioactive wastes, Water pollution treatment, Ion exchange, Filtration, Demineralization, Separation techniques.

An apparatus for the purification of water containing radioactive impurities is provided wherein the necessity for the handling of spent demineralization materials and filter elements is eliminated and the apparatus is disposable after the filter element and demineralization materials are exhausted. The apparatus includes a vessel having inlet and outlet structure and provision for filtration of undissolved solids and ion exchange removal of dissolved solids. The vessel is encased in a radiation impervi-

ous material and the method contemplates utilization of filtration materials and ion exchange materials substantial to exhaustion thereafter to dispose of the entire structure. (Sinha-OEIS)
W79-02307

CONTINUOUS TREATMENT OF LIQUID EFFLUENT AND SEWAGE,
Imperial Chemical Industries Ltd., London (England) (Assignee).
G. F. G. Clough.
U.S. Patent No. 4,108,763, 5 p, 4 fig, 3 ref; Official Gazette of the United STates Patent Office, Vol 973, No 4, p 1818, August 22, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, *Sewage treatment, Industrial wastes, Oxygenation, Compressible flow, Aerobic conditions, Equipment, Decompression.

A method and apparatus for the treatment of liquid-borne sewage or effluent is described in which the liquid is circulated first through a tubular coil or a compression coil which is rotating about a vertical axis. The pressure exerted on the liquid increases continuously as the liquid passes from the innermost end of the coil to the outermost end of the coil. Next the liquid is circulated through a tubular coil or decompression coil which is rotating about a vertical axis. The pressure exerted on the liquid decreases continuously as it passes from the outermost end of the coil to the innermost end of the coil. An oxygen-containing gas is supplied to the liquid as it passes through the compression coil. When the liquid is compressed there is a reduction in the size of the oxygen-containing gas bubbles and dissolution of gas. This achieves an efficient transfer of oxygen and the aerobic process takes place efficiently. When the liquid enters the rotating decompression coil, the bubbles reappear and gradually increase in size and aid the circulation of the liquid. (Sinha-OEIS)
W79-02310

SEPARATION OF AN AQUEOUS OR WATER-MISCIBLE LIQUID FROM A FLUID MIXTURE,
Georgia-Pacific Corp., Portland, OR. (Assignee).
W. D. Cooper.
U.S. Patent No. 4,108,767, 5 p, 12 ref; Official Gazette of the United States Patent Office, Vol 973, No 4, p 1819, August 22, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Industrial wastes, Chemical wastes, Separation techniques, Magnetic fields, Ferromagnetic iron compositions.

In many chemical processes, streams or products of water-immiscible organic liquids are obtained in which water is dispersed to various extents. Only partial separation of the water from the organic liquid may be obtained by settling, or centrifugation, and further processing is required. Therefore, a process is provided for the separation from a fluid of water of a water-miscible liquid dispersed in the fluid by use of a magnet or a magnetic field. A water soluble ferromagnetic composition selected from the group consisting of ferromagnetic iron lignosulfonates, ferromagnetic iron sulfonated tannins, and ferromagnetic iron compositions of a sulfonated phenol condensed with an aldehyde is added to the fluid containing the dispersed water. The water-soluble ferromagnetic composition is intermixed with the fluid mixture which is then subjected to a magnetic field resulting in the mixture being attracted and thus separated. (Sinha-OEIS)
W79-02311

METHOD OF CLARIFYING INDUSTRIAL WASTE WATER,
Winchester Chemical Co., Franklin Park, IL. (Assignee).
R. V. Sebelik, and W. Schaefer.
U.S. Patent No. 4,108,768, 6 p, 2 fig, 1 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 973, No 4, p 1819, August 22, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, Water pollution treatment, Industrial wastes, Flocculation, Separation techniques, Laundering.

An industrial waste water containing hexane soluble impurities is adjusted in pH to a value of a least 11.6 and thereafter calcium chloride is added to that waste water in an amount of at least 1,700 parts per million, based on the total weight of industrial waste water. A metal hydroxide floc results which includes a substantial portion of the hexane soluble impurities attached to or incorporated in the floc. The floc can be agglomerated with conventional coagulants and then separated from the clarified waste water. The calcium chloride will react at this very high pH to effectively flocculate a substantial portion of the oils and greases (hexane solubles) in addition to a substantial portion of the contaminating metal ions in the industrial waste water. (Sinha-OEIS)
W79-02312

PROCESS FOR REDUCING THE MERCURY CONTENT OF INDUSTRIAL WASTE WATERS,
Hoeschst A. G., Frankfurt am-Main (West Germany). (Assignee).
M. Krieg, and T. Olffers.
U.S. Patent No. 4,108,769, 6 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 973, No. 4, p 1819-1820, August 22, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, *Mercury, Ion exchange, Chemical reactions, Chemical precipitation, Separation techniques, Filtration.

The invention deals with the reduction of the mercury content of industrial waste waters, especially those from a chlorine-alkali electrolysis using the amalgam process. All mercury present in the waste water is converted to the form of Hg++ ions by adding chlorine. Subsequently Fe++ ions are added. The pH of the solution is raised until a redox potential of from -0.1 to -0.8 volts, relative to the normal hydrogen electrode, is obtained. The mercury precipitated and the iron oxide hydrate formed may be filtered from the waste water. Residual mercury contents in the filtrate of about 50 mg/cu m may be obtained. (Sinha-OEIS)
W79-02313

METHOD FOR TREATING A MEDIUM CONTAINING WATER WITH COAGULANTS,
W. Vogel.
U.S. Patent No. 4,110,209, 6 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2309, August 29, 1978.

Descriptors: *Patents, *Waste water treatment, *Water treatment, *Water purification, Water pollution treatment, *Coagulation, Flocculation, Mixing, Chemical precipitation, Separation techniques.

A method for increasing the chemical efficiency of precipitating agents having a metal base in the treatment of water, waste water or sludge is described. The medium to be treated is initially conducted by pressure into a mixing cell where it is mixed in free turbulence with a precipitant solution and caused to react to form a reaction mixture containing flocs. The reaction mixture is conducted into a separating basin in which the flocs are removed from the clear water. (Sinha-OEIS)
W79-02322

PROCESS FOR THE PREPARATION OF A SUBSTANTIALLY HOMOGENEOUS LIME WATER SOLUTION,
S. A. Henrikson.
U.S. Patent No. 4,110,211, 6 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 973, No. 5, p 2310, August 29, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, Water pollution treatment, Separation techniques, Flocculation, Lime, Equipment.

In the preparation of homogeneous lime water solution for use in the purification of waste water, a lime water suspension is used as starting material. The lime water suspension is supplied at the bottom of a compartment where it is caused to rise. It passes lamellas (baffles) during its upward movement. The lamellas are arranged in such a way that they create a sludge zone in the lower part of the compartment where the rising lime suspension is filtered. The lamellas create a clarification zone at the upper part of the compartment where the fine particles are separated. (Sinha-OEIS)
W79-02323

METHOD OF TREATING A WASTE LIQUID CONTAINING POLLUTING COMPOUNDS,
D. Krofchak.
U.S. Patent No. 4,110,212, 5 p, 6 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2310, August 29, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Chemical reactions, Waste disposal, Solid wastes, Hydrogen ion concentration, Landfills, *Chemical precipitation, Inert precipitates.

Waste water containing polluting compounds is mixed with an acidic ferrous salt solution to adjust the pH of the liquid to a value within the range of from about 2 to about 5 and to reduce polluting compounds in the waste water to a form capable of reacting with an alkali to produce a precipitate. The adjusted waste water is then reacted with an alkali to raise the pH of the liquid to a value within the range of from about 9 to about 12.5 and to produce the precipitate. The alkaline waste water is then reacted with a silicic compound to form large complex silicate molecules with the precipitate and consequent solidification of the waste water into a stable, non-polluting solid, which may be used as land fill or road foundations. (Sinha-OEIS)
W79-02324

DRAINAGE DEVICE FOR PARTICULATE MATERIAL,
South African Block and Concrete (Pty) Ltd., Alberton. (Assignee).
J. B. Pfeffer.
U.S. Patent No. 4,110,214, 8 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2311, August 29, 1978.

Descriptors: *Patents, Water pollution treatment, *Waste water treatment, *Suspended solids, Separation techniques, Solid wastes, Equipment, *Drainage devices.

A drainage device comprising a bucket wheel has circumferentially spaced foraminuous buckets. In operation, when the bucket wheel rotates, the buckets in succession scoop out quantities of liquid having solids in suspension. The liquid drains away and the solids remain in the buckets and are later discharged before the buckets enter the liquid again. Rotation of the wheel about its axis takes place in arcuate steps by the operation of a pair of axially spaced plunger and cylinder assemblies engaging alternately in cyclic fashion with shoulders circumferentially spaced about the wheel axis. The number of steps per revolution may lie within the range of ten to forty inclusive. (Sinha-OEIS)
W79-02326

LIQUID LEVEL CONTROL SYSTEM FOR SEPARATION TANK,
Sun Oil Co., Philadelphia, PA. (Assignee).
D. A. Bramlett.
U.S. Patent No. 4,110,215, 7 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2311, August 29, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Industrial wastes, Sepa-

ration techniques, Flow control, Water level, *Weirs, Equipment.

Separation tanks are often used to separate pollutants from waste water discharges from industrial processes before the water is permitted to be discharged into a natural body of water. One aspect of the separation tank operation which relates to its efficiency for controlling the quality of the effluent water is the maintenance of the liquid level within the tank within predetermined tolerances. This inventions provides a automatic liquid level controller for a separation tank. The automatic liquid level control system includes an external stilling well mounted on the side of the separation tank and having a liquid level sensing means which produces a pneumatic signal to the liquid level. A pneumatic operator receives the pneumatic signal and maintains the proper position of the weir gate in the weir or outfall box of the separation tank, so that the amount of effluent water flowing from the tank is appropriately regulated to maintain the desired liquid level in the tank. (Sinha-OEIS)
W79-02327

POLYQUATERNARY COMPOUNDS FOR THE CONTROL OF MICROBIOLOGICAL GROWTH,
Chemed Corp., Cincinnati, OH. (Assignee).
S. A. Shair, S. N. Paul, and J. E. Cairns.
U.S. Patent No. 4,111,679, 4 p, 3 tab, 6 ref; Official Gazette of the United States Patent Office, Vol. 974, no 1 P 293 September 5, 1978.

Descriptors: *Patents, *Industrial water, *Waste water treatment, Water quality control, Organic compounds, Microorganism, Slime, Bacteria, Fungi, Algae, Polyquaternary amines.

The method for controlling microorganisms in industrial cooling water systems comprises adding to the system a microbiocidal amount of a polyquaternary amine. The polyquaternary amines appear to be effective in controlling a broad range of bacteria, fungi, and algae, over a wide pH range, and at low dosages. The invention is of particulr value in slime control in industrial applications, such as air conditioning units, cooling water systems, etc. (Sinha - OEIS)
W79-02331

FILRATION SYSTEM,
Canplan Filtration Ltd., Halifax (Nova Scotia).
J. Jay, G. D. Bonner, and O. J. Betancourt.
U.S Patent No. 4,111,801, 12 p, 8 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 328-329, September 5, 1978.

Descriptors: *Patents, *Oil pollution, *Waste water treatment, Water pollution treatment, Industrial wastes, *Filtration, Water quality control, *Bilge water, Oil recovery, Plastic foam.

Methods and apparatus for filtering liquids such as oil contaminated water includes spaced apart supply and take-up reels capable of storing an elongated compressed ribbon of flexible open cell foam. In operation the ribbon of filtering medium, in the uncompressed state, extends between the reels across a support such as a grid or screen which permits free flow of water through the filter medium. The contaminated water is supplied to the upper side of the filter medium through a system which evenly distributes the contaminated water. The water passing through the filter medium may be collected in a suitable tank or basin. When the exposed section of filter medium becomes so loaded with contaminants (such as oil) that the flow through the filter decreases, the ribbion is advanced to expose a fresh sectin. Means are provided for compressing the contaminated ribbon to extract the oil before it is wound up on the take-up reel. The recovered oil is directed to a receptacle. Both the supply and take-up reel are provided with compression means which assist in compressing the ribbon of filter thereby contributing greatly to the compactness of the overall system. (Sinha-OEIS)
W79-02332

PROCESS FOR RECOVERING PROTEINACEOUS MATTER FROM ACID WHEY AND TANNERY UNHAIRING EFFLUENTS,
Department of Agriculture, Washington, DC. Office of the Secretary. (Assignee).
R. E. Townend.
U.S. Patent No. 4,111,803, 3 p, 1 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 974, no 1, p 329, September 5, 1978.

Descriptors: *Patents, *Water pollution, *Industrial wastes, Separation techniques, Chemical wastes, Tannery wastes, Dairy industry, Proteins, Amino acids.

Tannery unhairing waste and acid whey are mixed in proportions containing from 20 to 40% by volune of the tannery waste to spontaneously precipitate proteinaceous matter from both waste effluents and leave a relatively clean supernatant liquid. When the mixture is warmed to about 70C, all macromolecular components are quatitatively precipitated. (Sinha - OEIS)
W79-02334

GRAVITATIONAL SEPARATOR FOR MIXTURES OF IMMISCIBLE LIQUIDS OF DIFFERENT DENSITIES,
National Marine Service, Inc., St. Louis, MO. (Assignee).
D. A. Wright, and C. H. Walters.
U.S. Patent No. 4,111,806, 9 p, 4 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 330, September 5, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water quality control, Waste water treatment, Separation techniques, Equipment, Density, Coalescence, Bilge water, Gravity separation, Backflushing.

An improved gravitational separator for mixtures of immiscible liquids of different densities, particularly oil and water, includes a reaction member in the form of a dome or diaphragm immersed in more dense liquid to be separated and which floats upwardly under the influence of liquid of less density accumulated beneath the dome or diaphragm. A coalescer screen filter system is provided in the water outlet path in the separator, the coalescer screens being contained in a chamber provided with automatically operating, one-way, pressure responsive valves to ensure proper flow of water in a forward and backflush sense through the chamber. A flotation feature for the reaction member is provided, and the reaction member includes an auxiliary air chamber to prevent loss of a minimum desired residual layer of less dense fluid beneath the reaction member when air accumulates in this area. A specific inflow and outflow conduit arrangement is provided to carry backflushed oil from the coalescer to the inlet conduit of the separator. (Sinha-OEIS)
W79-02336

DESALINATION REVERSE OSMOTIC MEMBRANES AND THEIR PREPARATION,
Shinetsu Chemical Co., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 3A.
W79-02338

SCANNING APPARATUS FOR SEPTIC EFFLUENTS,
Environmental Devices Corp., Marion, MA. (Assignee).
W. B. Kerfoot, and E. C. Brainard, II.
U.S. Patent No. 4,112,741, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 974, No 2, p 643, September 12, 1978.

Descriptors: *Patents, *Water pollution, *Monitoring, Measurement, Sampling, Instrumentation, Subsurface waters, Subsurface drainage, Water quality control, Effluents.

A continuously operative sample intake is traversed along the shoreline at a preselected subsurface level appropriate for picking up effluents emanating from on-shore septic systems. The conductivity and the fluorescence of the sampled water are measured continuously, the wavelength of the fluorescence measured being chosen to determine the presence of aromatic hydrocarbons and detergent whiteners which are present in distinctive proportions in recharged septic effluents. Signal processing means are incorporated for generating an output signal which varies as a function of the conjoint deviation of the two measurements from the values which are representative of background levels. (Sinha-OEIS)
W79-02340

WASTE WATER RECLAMATION APPARATUS,
J. B. Lajeuness.
U.S. Patent No. 4,112,972, 4 p, 4 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 974, No 2, p 722, September 12, 1978.

Descriptors: *Patents, *Waste water(Pollution), *Water reuse, Water utilization, Irrigation water, Reclaimed water, Impaired water use, Equipment, Valves.

The object of this invention is to collect waste water from selected sources and distribute it to selected outlets. A conduit arrangement is provided which is coupled to selected sources of waste water whereby the water is collected into a storage container and held in the container pending demand distribution of the waste water into selected outlets such as for lawn and plant irrigation purposes. Means are provided for gravity flow of the waste water through the system and a diverter valve is included for separating 'gray' water from the conventional black water sewer system. This one-piece device also maintains proper sewer functioning in its open position by allowing atmospheric pressure to reach downstream backflow from reaching the diversion. In the open position, it is 100% efficient with normal flow; with peak flow it has an efficiency of about 90%. In the closed position, it maintains the original drain and sewer function. (Sinha-OEIS)
W79-02341

GREASE SEPARATOR,
F. P. Bereskin, and J. J. Borowczyk.
U.S. Patent No. 4,113,617, 7 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 974, No 2, p 934, September 12, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, Separation techniques, Cooling, Equipment, *Grease traps, F.O.G.(Fats oils, greases).

A grease separating system includes four successive chambers. The heated, emulsified grease is passed through a solids retention box into an inlet chamber where cool water is sprayed onto the emulsified grease. This mixture is passed through a connecting chamber, and then over baffles at the entrance of a collection chamber. The grease having been separated from its emulsified state rises to the top of the mixture in the collection chamber, and the water passes into a discharge chamber and in to the connected sewer system. After successive operations, the floating grease is sensed when it reaches a predetermined level, and an alarm is sounded to indicate that the accumulated grease should be removed. (Sinha-OEIS)
W79-02342

WASTE FLUID TREATMENT SYSTEM,
Arrington Co., Inc., Muskego, WI. (Assignee.
J. R. Arrington.
U.S. Patent No. 4,113,619, 6 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 974, No 2, p 935, September 12, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, *Chemical reactions, Mixing, Safety, Equipment, *Cyanides, *Metal plating industry.

A system for chemically treating waste water includes a storage tank, a recreation tank, and a

pump for transferring the waste water from the storage tank to the reaction tank. Conduits connecting the pump to the tank and control valves controlling the flow through the conduits are arranged so that, by coordinated actuation of the valves, the pump recirculates the waste water through the reaction tank to provide intermixing of the treatment chemicals and discharges the waste water from the reaction tank after treatment. The chemical reagents are introduced into the system on the suction of the pump so that gravity feed or separate pumping means is not required for the reagents. The tanks are preferably circular and mounted in a spaced relationship on a common base. Equipment for controlling the operation of the pump, the control valves, and the addition of the reagents are carried on a control panel. (Sinha-OEIS)
W79-02343

PLANNING AND STARTUP OF A FLEXIBLE ACTIVATED SLUDGE INSTALLATION (BIO-FLEX PROCESS) AS A BIOLOGICAL CLARIFICATION STAGE IN A BOARD MILL (PLANUNG UND INBETRIEBNAHME EINER FLEXIBLEN BELEBTSCHLAMMANLAGE (BIO-FLEX-VERFAHREN) ALS BIOLOGISCHE KLAERSTUFE EINER KARTONFABRIK),
Kartonfabrik Buchmann GmbH., Rinnthal (West Germany).
G. Renz.
Wochenblatt fuer Papierfabrikation, Vol. 106, No. 10, p 359-362, May 31, 1978. 5 fig, 1 illus, 3 ref, 3 tab.

Descriptors: *Biological treatment, *Waste water treatment, *Pulp wastes, *Board mills, Wastes, Industrial wastes, Water pollution treatment, Waste treatment, Water polluton sources, Activated sludge, Biochemical oxygen demand, Chemical oxygen demand, Sludge, Costs, Pulp and paper industry, Planning, Treatment facilities, Operation and maintenance, Water purification, Water pollution control.

Adding a biological clarification stage to an existing installation requires the establishment of a favorable ratio of water volume to concentration of impurities. As the water cycle approaches closure, the impurity concentration rises but the daily load is somewhat reduced. Using a modified activated sludge unit, satisfactory BOD and reduced COD were obtained. Advantages of this installation are its reliable operation at various pollution loads, properties of the activated sludge, and the low sludge index. The cost of the installation is low compared to figures given in the literature. (Ward-IPC)
W79-02361

SCREENING -- A NOVEL APPROACH TO PRIMARY TREATMENT,
Combustion Engineering Inc., Brantford (Ontario). C-E Bauer Div.
T. G. Phillips.
Water and Pollution Control, Vol. 116, No. 5, p 42-45, May/June, 1978. 3 illus.

Descriptors: *Pulp wastes, *Waste water treatment, *Screens, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Costs, Economics, Effluents.

The use of static screens for primary effluent treatment is increasing, because they are inexpensive to install and operate and require limited floor space. The C-E Bauer Hydrasieve screen is one type of vertically mounted static screen that is available for the removal of solids. Although this screen was designed to thicken slurries in the pulp and paper industries, it has become widely accepted in the handling of various industrial waste waters. The screen is a pretreatment or primary treatment device, removing solid matter to create an effluent more readily treatable with existing equipment. A Hydrasieve screen can be installed for approximately 25-35% of the cost of a primary clarifier. (Louden-IPC)
W79-02363

OPERATION OF THE (EFFLUENT) PURIFICATION EQUIPMENT AT THE RAZLOG PULP AND PAPER MILL (OPIT OT RABOTA NA PRECHISVATELNATA STANTSIYA KEM KTSKH RAZLOG),
L. Torbin, K. Stoichkov, and V. Tumbeva.
Tseluloza i Khartiya, Vol. 8, No. 6, p 24-26, 1977. 1 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Operation and maintenance, *Treatment facilities, Wastes, Industrial wastes, Waster treatment, Water pollution treatment, Water pollution sources, Foreign countries, Activated sludge, Pulp and paper industry, Effluents, Biological treatment, Biochemical oxygen demand, Sludge, Oxidation, Municipal wastes, Soviet Union(USSR).

The effluents of the Razlog pulp and paper mill (USSR) are treated jointly with the town's sewage by the activated sludge process. The treatment plant includes a mechanical purification line for the sewage, a mechanical purification line for the mill effluents (spent liquors and fiber-containing effluents), a blending tank where the two are mixed, and a biological purification line. According to specifications, a BOD reduction of 15% should occur in an aerated 7,560 cu m capacity blending tank. In practice, the BOD reduction was only 12%. In an attempt to improve the biological oxidation in the system, activated sludge was added to the blending tank to give a concentration of 150-200 mg/liter. The results of this modification were: a prolongation of the contact time of the sludge with the effluents; an increase of BOD reduction in the blender from 12 to 34%; and a reduction of the BOD load in the aeration tanks. Presently, the biological oxidation process has become a two-stage process, the blending tank operating as a mixer and aeration tank. (Stapinski-IPC)
W79-02367

POSSIBILITIES AND MEASURES IN THE PULP INDUSTRY IN THE INTEREST OF ENVIRONMENTAL PROTECTION (MOEGLICHKEITEN UND MASSNAHMEN DER ZELLSTOFFINDUSTRIE IM INTERESSE DES UMWELTSCHUTZES).
For primary bibliographic entry see Field 5G.
W79-02369

PULP INDUSTRY AND WATER POLLUTION CONTROL (ZELLSTOFFINDUSTRIE UND GEWAESSERSCHUTZ),
For primary bibliographic entry see Field 5G.
W79-02370

USE OF THE ACTIVATED SLUDGE PROCESS IN PURIFYING WASTE WATERS FROM PULP PRODUCTION, ESPECIALLY KRAFT PULP PRODUCTION (ANWENDUNG DES BELEBTSCHLAMMVERFAHRENS ZUR REINIGUNG VON ABWAESSERN AUS DER ZELLSTOFFPRODUKTION, INSBESONDERE DER SULFATZELLSTOFFPRODUKTION),
J. Nowacki.
Technik und Umweltschutz, Vol. 13, p 168-175, 1976. 17 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Waste treatment, Pulp and paper industry, Effluents, Sulfite liquors, Biological treatment, Color, Biochemical oxygen demand, Chemical oxygen demand, United States, Foreign countries, Europe, Treatment facilities, Poland, Kraft mills.

Following brief descriptions of five United States and three Polish pulp mill effluent treatment installations, the composition of waste waters from sulfite and sulfate (kraft) pulping are compared. Also discussed are the advantages and disadvantages of biological purification of pulp mill effluents and the use of semitechnical studies as a basis for the selection of treatment plant parameters. The activated sludge process is the main process used in treating kraft mill effluents, being superior to other known processes with respect to purification capacity and economy. However, this process is not particularly effective in reducing color. Typical data for an activated sludge plant include a 5-day BOD reduction of 86.9%, a COD reduction of 51.4%, and a color reduction of 20.0%. (Speckhard-IPC)
W79-02371

PURIFICATION OF EFFLUENTS OF THE VERKHOTURSK WOOD CHEMICAL PLANT IN STORAGE PONDS (OCHISTKA STOCHNYKH VOD VERKHOTURSKOGO LESOKHIMICHESKOGO ZAVODA V PRUDU-NAKOPITELE),
N. P. Drozdov, Z. K. Kuptsova, V. E. Zyuzyun, and N. A. Boiko.
Sbornik Trudov, Tsentralnyi Nauchno-Issledovatelskii i Proektnyi Institut Lesokhimicheskoi Promyshlennosti, No. 24, p 141-146, 1975. 1 fig, 4 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Foreign countries, Waste treatment, Biochemical oxygen demand, Chemical oxygen demand, Neutralization, Nutrients, Hydrogen ion concentration, Effluents, Soviet Union(USSR).

At the Verkhotursk wood chemical plant (USSR) the effluents are discharged jointly with sewage into two storage ponds (75 cu m capacity each). A study was made to determine the degree of biological purification occurring in these nonaerated ponds. Preliminary laboratory experiments indicated substantial reductions of BOD and COD if the effluent is neutralized (to pH 7.4-7.6) and nutrients are added. Such a treatment was applied to the effluents prior to discharge into the ponds, and samples were analyzed over a period of two summer months. The BOD and COD reductions during this period were 72 and 68.6%, respectively. (Stapinski-IPC)
W79-02372

PROCESSING OF PULP AND PAPER INDUSTRY WASTE BY REVERSE OSMOSIS FOR POLLUTION CONTROL,
N. V. Desai, A. V. Rao, and D. J. Mehta.
Salt Research and Industry, Vol. 12, No. 2, p 24-25, 1976.

Descriptors: *Pulp wastes, *Waste water treatment, *Reverse osmosis, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Foreign countries, Membrane processes, Separation techniques, Membranes, Suspended solids, Chlorides, Sulfates, Chemical oxygen demand, Biochemical oxygen demand, Hydrogen ion concentration, Color, Dissolved solids, Pulp and paper industry, Effluents, Cellulose acetate.

Data are presented showing the characteristics of effluent from Central Pulp Mills Ltd. (India) before and after reverse osmosis through a cellulose acetate membrane at 600 psi. The permeate from the reverse osmosis plant contained 10 ppm color (Pt-Co unts), trace amounts of suspended solids, 180 ppm of dissolved solids, 49.7 ppm chloride and 4.12 ppm sulfate, and had a COD of 61.85 ppm, a BOD (5 days at 20C) of 10 ppm, and a pH of 7.8. The treated effluent can be discharged or reused in the manufacturing process. (Witt-IPC)
W79-02373

POSSIBILITIES FOR REDUCING COD AND 5-DAY BOD IN WASTE WATERS FROM THE PULP AND VISCOSE RAYON FIBER INDUSTRIES (MOEGLICHKEITEN ZUR REDUKTION DES CSB UND BSB(5) IN DEN ABWAESSERN DER ZELLSTOFF- UND VISKOSEFASERINDUSTRIE),
Chemiefaser Lenzing A. G., Lenzing (Austria).
P. Keppelmuller.
Muenchner Beitraege zur Abwasser-, Fischerei- und Flussbiologie, Vol. 28, p 63-80, 1977. 6 fig, 10 tab.

Descriptors: *Pulp and paper industry, *Rayon, *Water pollution control, *Chemical oxygen demand, *Biochemical oxygen demand, Foreign countries, Europe, Water pollution sources, Pulp wastes, Sulfite liquors, Effluents, Water pollution, Austria, Sulfite pulp mills.

Chemiefasern Lenzing AG. (Austria) produces 80,000-100,000 tons of rayon fiber/year and incorporates a sulfite pulp mill producing 100,000-110,000 tons/year. The integrated mill also includes a plant for manufacturing sulfuric acid as well as facilities for producing synthetic fibers, paper, plastic films, and lumber. The development of effluent treatment operations at the mill over the last 20 years is reviewed. Pollution control measures have included switching to magnesium-base sulfite pulping using the mill's own patented process. The biological degradability of bleaching effluents has been studied, but a satisfactory process for treating them has not yet been found. The present daily effluent load from the pulp mill amounts to 80,000 cu m, incorporating 45 tons of dissolved organic substance, 95 tons of COD, and 28-30 tons of 5-day BOD. Corresponding figures for the viscose rayon operation are 25,000 cu m, 20 tons COD, and 7.5 tons BOD. (Speckhard-IPC)
W79-02376

STATUS AND METHODS FOR EFFLUENT PURIFICATION IN PULP AND PAPER MILLS (STAND UND VERFAHREN DER RESTABWASSERREINIGUNG VON ZELLSTOFF- UND PAPIERFABRIKEN),
Techische Univ., Darmstadt (West Germany). Wasser und Abwasserforschungsstelle.
H. L. Dalpke.
Muenchner Beitraege zur Abwasser-, Fischerei- und Flussbiologie, Vol. 28, p 43,62, 1977. 15 fig, 11 ref, 17 tab.

Descriptors: *Pulp and paper industry, *Waste water treatment, *West Germany, Water pollution sources, Wastes, Industrial wastes, Waste treatment, Biological treatment, Effluents, Biochemical oxygen demand, Chemical oxygen demand, Economics, Research and development, Water pollution treatment, Foreign countries, Europe, Sewage treatment.

Data are reviewed concerning the pollution load of pulp and paper mill effluents in West Germany, and the development of effluent treatment measures is outlined. Emphasis is on mechanical and biological clarification of paper mill effluents. About one-fifth of the paper mill effluent in West Germany is presently being subjected to secondary biological clarification, the BOD load normally being reduced by more than 90% and the COD load by 70-90%. New clarification techniques (adsorption, oxidation, electroflotation, electrodialysis, electrolysis, chemical precipitation, reverse osmosis, ion-exchange, gamma-irradiation, evaporation, freezing) appear to be too expensive for use in processing paper mill effluents. (Speckhard-IPC)
W79-02377

PURIFICATION OF KRAFT PULPING EFFLUENTS BY ELECTROCHEMICAL OXIDATION (OCHISTKA STOKOV SUL'FATNO-TSELLYULOZNOGO PROIZVODSTVA ELEKTROKHIMICHESKIM OKISLENIEM),
Irkutskii Inst. of Orgaic Chemistry (USSR).
E. N. Serdobol'skii, M. I. Anisimova, and V. A. Babkin.
Khimiya Drevesiny, No. 1, p 41-46, January/February, 1978. 2 fig, 15 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Electrochemistry, *Oxidation, Water pollution treatment, Waste treatment, Water pollution sources, Wastes, Industrial wastes, Pulp and paper industry, Electrodes, Chemical oxygen demand, Color, Phenols, Lignins, Hydrogen ion concentration, Electric currents, Lead, Titanium, Graphite.

The electrochemical oxidative purification of kraft pulping effluents was investigated on effluents after biological purification but prior to chemical purification, on black liquor, on bleach plant effluents following the first alkali, extraction stage, and on condensates from evaporation units. Various materials (lead, titanium, graphite) were used as electrodes. Depending on the electrode material, on electroconductive additives, and on effluent composition, the purification achieved 65.5-87.0% reduction of COD, 40-99.5% removal of color, and 78-100% elimination of phenolic content. Lignins were completely removed from the effluents. Data on the effects of current density, pH, and electrode material on the degree of purification of the various effluents indicated that increasing current density up to 2-4 amp/sq dm sharply reduced the COD. The effect of pH was complicated, but the best pH using lead electrodes was 7-9. In spite of consuming a large amount of electrical energy, this method could become important for closed systems if electrical energy becomes cheaper. (Chern-IPC)
W79-02380

CHEMICAL FOAM CONTROL DURING EFFLUENT TREATMENT IN AERATION TANKS (KHIMICHESKOE PENOGASHENIE PRI OCHISTKE STOCHNYKH VOD V AEROTENKAKH),
Syavskii Leskokhimicheskii Zavod (USSR).
N. P. Drozdov, G. S. Kudryavtsev, N. G. Bondarchik, and P. S. Fokin.
Gidroliznaya i Lesokhimicheskaya Promyshlennost', No. 2, p 24-25, 1978. 4 ref, 2 tab.

Descriptors: *Aerated lagoons, *Waste water treatment, *Foam control, *Chemcontrol, Wastes, Industrial wastes, Foreign countries, Water pollution sources, Water pollution treatment, Effluents, Waste treatment, Distillation, Toxicity, Activated sludge, Microorganisms, Biological treatment, Foaming, Wood distillation, Chemical industry, Showers, Sprinklers.

Foam control in aeration tanks at the Syava wood chemical plant (USSR) is achieved with sprinklers. Because of inadequate control and clogging of the sprinkler nozzles, a study was made to determine the foam control efficiency of several chemical agents. These included turbine oil, axle oil, solar oil, four commercial antifoam agents, synthetic aliphatic alcohols (5.8, 7-12, and 10-18 carbon fractions), and the distillation residue of the 7-9 carbon fraction. The alcohols were effective, their effectiveness increasing with increasing molecular weight. The distillation residue was the most effective. The alcohols and the distillation residue were tested for their toxicity to the activated sludge microflora and their effect on the biological oxidation process. They were found to be nontoxic and to have no effect on oxidation. The use of the distillation residue for foam control at wood chemical plants (silvichemical factories) is recommended. (Stapinski-IPC)
W79-02382

DESALINATION IN THE REUSE OF INDUSTRIAL WASTE WATER,
Water Reuse Promotion Center, Tokyo (Japan).
H. Ogasawara, Y. Kunisada, H. Kaneda, and M. Hirai.
Desalination, Vol. 23, No. 1/3, p 113-122, 1977. 7 fig, 4 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Reverse osmosis, *Electrodialysis, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Waste treatment, Foreign countries, Asia, Pulp wastes, Desalination processes, Water purification, Activated sludge, Coagulation, Sedimentation, Lime, Neutralization, Sands, Filtration, Activated carbon, Adsorption, Reverse osmosis, Ions, Calcium, Sodium, Chlorine, Japan.

Studies to determine the feasibility of desalination of industrial waste waters were conducted by the Water Reuse Promotion Center (Japan) at a petrochemical plant and the Iwakuni pulp and paper mill of Sayo Kokusaku Pulp Co. Kraft bleach plant effluent was neutralized with caustic and treated with activated sludge, followed by coagulation and sedimentation with lime, neutralization by carbonation, sand filtration, activated carbon adsorption, and desalination by electrodialysis or reverse osmosis. Electrodialysis removed Ca, Na, and Cl ions at a high ratio. (Swichtenberg-IPC)
W79-02383

NITRATE REDUCTION BY DENITRIFYING BACTERIA IN SINGLE AND TWO STAGE CONTINUOUS FLOW REACTORS,
Queen's Univ., Kingston (Ontario). Dept. of Chemical Engineering.
D. J. R. Dodd, and D. H. Bone.
Water Research, Vol 9, No 3, p 323, 328, March 1975. 6 fig, 1 tab, 5 equ, 18 ref.

Descriptors: *Denitrification, *Nitrates, *Bacteria, Chemical reactions, *Waste water treatment, *Biological treatment, Continuous flow reactors, *Denitrifying bacteria.

Denitrification by a mixed bacterial population of medium containing 100 mg NO3-Nl-1 and acetate as carbon source was studied in batch, a single stage continuous flow stirred reactor (CFSTR) and a two stage CFSTR at 30 degrees C. The optimum pH for denitrification, nitratase, nitrite reductase activities and growth was found to be 7.5 in batch culture. (Skogerboe-Colo St)
W79-02406

PARTIAL CHARACTERIZATION OF CHLORINATED ORGANICS IN SUPERCHLORINATED SEPTAGES AND MIXED SLUDGES,
Municipal Environmental Research Lab., Cincinnati, OH.
R. H. Wise, T. A. Pressley, and B. M. Austern.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 529, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/2-78-020, March 1978. 29 p, 1 fig, 5 ref.

Descriptors: Pollutant identification, *Waste treatment, *Sludge treatment, *Chemical analysis, *Chlorination, *Inorganic compounds, *Organic compounds, *Laboratory tests, Septages, Sewage treatment, Sludge disposal, Chemical reaction, Organic wastes, Organic matter, Liquid wastes, Schoniger-flask combustion, Septic tanks.

The chlorinated organic materials produced by the Purifax process, a method for superchlorinating concentrated biological wastes to stabilize them, was studied to determine which types of chlorinated organics it produces, how such compounds are likely to be discharged, and the amount of liquids and or solids produced. Purifaxed samples of septage and mixed primary/secondary sludges were separated into solid and liquid phases, and analyzed for their chlorinated organic content. Total organic chlorine in the solid phases were determined by Schoniger-flask combustion. Both solid fractions contained 0.9% to 1.0% total organic chlorine, based on dry weight. Concentrated hexane-ether extracts of the liquid phases were analyzed for total organic chlorine by microcoulometric titration, and then analyzed by GC/MS for individual organic compounds. GC/MS analysis of the hexane-ether extracts and the helium-purgable, volatile organics in the unextracted phases yielded slighly higher concentrations of the same kind of organic compounds typically present in U.S. water supplies. Cyanogen chloride was present in all of the unextracted Purifax liquid phases in concentrations reaching 900 micrograms/l. It is recommended that the gaseous phase of the Purifax process, which is discharged from the reactor along with the solid and liquid phases, be analyzed. (Davison-IPA)
W79-02413

TREATMENT EFFECTIVENESS FOR THE REMOVAL OF SELECTED CONTAMINANTS FROM DRINKING WATER,
Stone (Ralph) and Co., Inc., Los Angeles, CA.
For primary bibliographic entry see Field 5F.
W79-02435

ADVANCES IN STORM AND COMBINED SEWER POLLUTION CONTROL ABATEMENT TECHNOLOGY,
Environmental Protection Agency, Washington, DC. Office of Research and Development.
A. Cywin, and W. A. Rosenkranz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 302, Price codes: A03 in paper copy, A01 in microfiche. Presented at the 4th Annual Conference of the Water Pollution Control Federation, San Francisco, CA, October 3-8, 1971. 29 p, 5 fig, 42 ref.

Descriptors: *Storm runoff, *Pollution abatement, *Sewers, *Water pollution sources, *Storm water treatment, Drainage systems, Storm drains, Urban drainage, Storm water, Separated sewers, Surface runoff, Storage, Storm water storage, Sewage treatment, Storm water quality, Sewage bacteria, Overflow, Waste water treatment, Flow control.

The combined sewer overflow pollution problem is viewed as a reflection of the inefficiencies inherent in the collection, transport, and treatment systems. The entire sewage system must be evaluated prior to the planning of modifications to provide the capability to adequately control and treat waste waters during and immediately following storms. Applicable solutions involve control facilities such as in and off-system storage, flow regulation and routing, remote flow-sensing and control coupled with treatment. Physical, chemical, biological and physical-chemical treatment methods are under investigation, with a screening dissolved-air flotation process and a high-rate multi-media filtration process offering the best current potential for producing good quality effluents. (Davison-IPA)
W79-02437

MANPOWER UTILIZATION AND FUTURE NEEDS OF MANUFACTURING INDUSTRIES IN WATER POLLUTION CONTROL,
Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W79-02438

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION FOR TOXAPHENE MANUFACTURE,
Midwest Research Inst., Kansas City, MO.
A. F. Meiners, C. E. Mumma, T. L. Ferguson, and G. L. Kelso.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 676, Price codes: A07 in paper copy, A01 in microfiche. Final Report No EPA-440/9-76-013, February 1976. 136 p, 16 fig, 10 tab, 53 ref, 2 append. MRI 4127-C. 68-01-3524.

Descriptors: *Waste water treatment, *Insecticides, *Toxaphene, *Industrial wastes, *Pesticides, Adsorption, Sedimentation, Activated carbon, Reduction degradation, Effluents, Pollutants, Estimated costs, Cost comparisons.

Toxaphene, produced by chlorination of camphene, with the resulting by-product of hydrogen chloride, is manufactured by four companies in the U.S.: Hercules, Inc., Tennaco Chemicals, Inc., Riverside Chemical Company, and Vicksburg Chemical Company. Current waste water management practices of the toxaphene industry and potential waste water treatment processes applicable to this industry are examined; a selection of those processes applicable to the Environmental Protection Agency's (EPA) toxic pollutant control technology requirements are discussed. The four toxaphene producing plants and their water treatment methods are characterized. The alternate systems considered for removing toxaphene from waste water are: (1) adsorption on synthetic resins, (2) reductive degradation, and (3) carbon adsorption. The systems have not been operated under conditions approximating actual use for toxaphene removal, and they have not been developed so that an accurate determination of costs or operating conditions can be made. A comparison of the effluents produced by the alternate treatment systems with the EPA guidelines with regard to Levels I, II and III technology is presented. Waste water treatment cost estimates, based on capital investment costs and annual operating costs, are discussed for currently used toxaphene waste water treatment, and for alternate waste water treatment systems. (Davison-IPA)
W79-02439

ASSESSMENT OF HAZARDOUS WASTE PRACTICES IN THE PETROLEUM REFINING INDUSTRY,
Jacobs Engineering Co., Pasadena, CA.
D. G. Rosenberg, R. J. Lofy, H. Cruse, E. Weisberg, and B. Beutler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 097, Price codes: A16 in paper copy, A01 in microfiche. Final Report No SW-129c, June 1976. 367 p, 23 fig, 140 tab, 57 ref, 15 append. 68-01-2288.

Descriptors: *Waste treatment, *Oil wastes, *Industrial wastes, *Hazardous wastes, *Cost analysis, Anaerobic digestion, Lagooning, Incineration, Landfills, Land spreading, Chemical analysis, Waste analysis, Disposal, Metals, Organic wastes, Sludge treatment.

A study was conducted: (1) to determine the nature, quality, and projected future quantity of potentially hazardous wastes generated by the petroleum refining industry in the U.S.; (2) to evaluate current waste management practices; (3) to examine improved technologies for waste treatment and disposal, the application of which would result in future reduction of waste hazard; and (4) to calculate the costs for three levels of waste treatment and technology. The industry is characterized in terms of refining processes employed, and future trends in petroleum refining and waste management are discussed. A total of 14 trace elements were selected for identification and measurement in refinery waste streams. Potentially hazardous organic compounds were too numerous for individual analysis; therefore, oil represented a composite of hazardous organic substances, and all refinery samples were analyzed to determine their constitutent percentages of oil water and solids. At the present time, 63% of refinery wastes are disposed of by landfilling, 28% by lagooning, 7% by landspreading and 2% by incineration. It is projected that recycling and reclamation of materials used in refining will increase, and that off site landfill disposal and lagooning will decrease; landspreading will increase. The cost to industry for waste treatment/disposal using three levels of technology varies from $1.80 to $260.93 metric ton with maximum 1974 costs estimated to be $54,216,000. Implementation of Level II or Level III technology can be achieved as an estimated cost to industry to $74,049,000. (Davison-IPA)
W79-02440

STORM AND COMBINED SEWER POLLUTION CONTROL PROGRAM REPORTS. RESEARCH, DEVELOPMENT, AND DEMONSTRATION GRANT, CONTRACT, AND IN-HOUSE PROJECT REPORTS.
National Environmental Research Center, Edison, NJ. Edison Water Quality Research Div.
For primary bibliographic entry see Field 5G.
W79-02442

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION FOR DDT MANUFACTURE,
Midwest Research Inst., Kansas City, MO.
A. F. Meiners, C. E. Mumma, T. L. Ferguson, and G. L. Kelso.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 013, Price codes: A05 in paper copy, A01 in microfiche. Final Report No EPA-440/9-76-009, June 1976. 99 p, 7 fig, 8 tab, 38 ref, 1 append. MRI-4127-C. 68-01-3524.

Descriptors: *Waste water treatment, *Industrial wastes, *DDT, Acidic waters, Alkaline water, Solvent extractions, Cost analysis, Cost comparisons, Adsorption, Activated carbon, Synthetic resin.

The treatment of waste water resulting from the production of DDT by Montrose Chemical Corporation, the sole U.S. manufacturer of DDT, is examined. Alkaline waste water and acid waste water that results from the production process are presently hauled offsite by truck and disposed of in an approved class 1 California dump. Four alternative alkaline waste water treatment systems being considered for reducing the concentration of DDT and related compounds and the daily load are examined in detail. The four systems are: a solvent extraction/Friedel-Crafts method; a two-stage solvent extraction system; activated carbon adsorption; and synthetic resin adsorption. A summary of estimated costs for these selected alkaline waste water treatment systems is shown, and the concentration of DDT in the treated effluent is estimated. (Gibson-IPA)
W79-02444

BENZIDINE: WASTEWATER TREATMENT TECHNOLOGY,
Keinath (Thomas M.), Senaca, SC.
T. M. Keinath.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 024, Price codes: A07 in paper copy, A01 in microfiche. Final Report No EPA-440/9-76-018, June 1976. 131 p, 7 fig, 17 tab, 30 ref, 4 append. WA-6-99-1309-A and 68-01-3390.

Descriptors: *Waste water treatment, *Benzidine, *Industrial wastes, *Treatment facilities, Chemical industry, Cost analysis, Cost comparisons, Oxidation, Adsorption, Ozone, Nitrous acid, Activated carbon, Activated sludge, Biological treatment, Surveys, On-site investigations.

Information is provided on: (1) the occurrence of benzidine in the waste waters of synthetic organic chemical manufacturing facilities; (2) the occurrence of benzidine in the waste waters of benzidine-based dye users; (3) prospects for no aqueorus discharge; (4) applicable waste water treatment technology; and (5) to establish the effect of benzidine on publicly owned waste water treatment facilities. Material was gathered, in part, through a questionnaire survey and personal visits to benzidine-based dye manufacturers and applicators. Results indicate that: (1) available manufacturers' housekeeping measures are adequate to prevent the discharge of benzidine directly to process lines; (2) benzidine in waste water can effectively be treated by oxidation with nitrous acid and ozone and adsorption with granular activated carbon, however, costs vary; and (3) pretreated benzidine will not adversely affect municipal biological waste water treatment systems. (Gibson-IPA)
W79-02445

ADSORPTION OF POLIOVIRUS TYPE I TO WASTEWATER TREATMENT PLANT SOLIDS,
California Univ., Los Angeles. Dept. of Chemical, Nuclear and Thermal Engineering.
R. S. Kamdar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 312, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1978. 109 p. 10 fig, 9 tab, 58 ref. (California Water Resources Center Project UCAL-WRC-W-523). OWRT B-184-CAL(1).

Descriptors: *Viruses, *Waste water disposal, *Waste water treatment, Isotherms, Adsorption, *Poliovirus Type I, Solid wastes, Cations.

The association of poliovirus type 1 (CHAT), a human enteric virus, to solid products of the secondary wastewater treatment process was investigated. These studies have demonstrated a fraction of the total poliovirus present became associated with the solids. The solids-associated viruses retained their inefectivity in the tissue culture monolayer; therefore, the association of virus with solids cannot be equated to inactivation. Most of the associated virus can be eluted from the solids in viable form. Thus, the process is reversible. Most of the association of virus to the solids occurred rapidly within the first five minutes of the contact period. Association was enhanced markedly in the

presence of metal cation. Sonication of the solids sample increased the association. The association of poliovirus to wastewater solids is an adsorption process and conforms to the Freundlich isotherm, an empirical relation described by q = u Cen where q is the number of viruses adsorbed per unit mass of solids, Ce is the virus concentration remaining in solution at equilibrium, and u and n are empirical constants. The range of virus concentration used was 10 to the fifth power to 10 to the eighth power PFU per liter. Solids concentration studied varied from 20 to 4800 mg/l. (Snyder-Calif, Davis)
W79-02446

POLLUTIONAL CHARACTERISTICS OF STORMWATER RUNOFF,
Colorado Univ., Boulder. Dept. of Civil, Environmental, and Architectural Engineering.
For primary bibliographic entry see Field 5B.
W79-02451

FISH FARMS ARE HAVING TO WATCH THEIR WASTE.
Vandkvalitetsinstitutet, Hoersholm (Denmark).
For primary bibliographic entry see Field 5G.
W79-02474

PROTEIN PRODUCTION RATES BY ALGAE USING SWINE MANURE AS A SUBSTRATE,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. Boersma, E. W. R. Barlow, J. R. Miner, H. K. Phinney, and J. E. Oldfield.
In: Energy, Agriculture and Waste Management, Proceedings of the 1975 Cornell Agricultural Waste Management Conference. p 475-493 (1975). Ann Arbor Science, Publishers. Ann Arbor, Michigan, 2 fig, 15 tab, 27 ref. OWRT B-039-ORE(4) and B-044-ORE(1).

Descriptors: *Farm wastes, Waste management, Hogs, Nutrient recovery, *Proteins, Algae, *Proteins, *Recycling.

A system is described for recycling nutrients contained in animal manure by growing algae using the digested waste as a substrate. The most encouraging aspect of the studies described has been the stability of the Chlorella vulgaris 211/8K cultures growing in fresh swine manure diluted to an ammonium nitrogen content of 250 mg/liter. Further dilutions reduced the growth rate. Manure solutions with higher nitrogen concentrations were not tested. Clarification of the manure by filtration through activated carbon or ferric chloride flocculation improved the light transmission dramatically. However, the algal growth rates were substantially lower in the clarified solutions. The superiority of the untreated swine manure was attributed to the higher organic matter content. It was suggested that the organic matter provides CO2 for algal photosynthesis by acting as a substrate for growth of bacteria. This observation was further substantiated by experiments in which CO2 was added to the cultures.
W79-02489

5E. Ultimate Disposal Of Wastes

ECONOMIC EVALUATION OF FOUR SLUDGE DEWATERING DEVICES,
For primary bibliographic entry see Field 5D.
W79-02037

YOU CAN TAILOR EFFLUENT BOD TO FIT THE RECEIVING-WATER ECOSYSTEM...AND ENHANCE THE ENVIRONMENT. URBAN AND FISH-PROCESSING WASTES IN THE MARINE ENVIRONMENT: BIOENHANCEMENT STUDIES AT TERMINAL ISLAND, CALIFORNIA,
University of Southern California, Los Angeles. Inst. for Marine and Coastal Studies.
D. F. Soule, M. Oguri, and J. D. Soule.
Sea Grant Reprint No. UCCSG-R-04-78. Reprinted from: Bulletin of the California Water Pollution Control Association, Vol 15, No 1, p 58-63, July 1978. 4 fig, 11 ref.

Descriptors: *Coasts, *Nutrients, *Waste disposal, *Ecosystems, Water quality, Organic wastes, Biochemical oxygen demand, California, *Bioenhancement, Fish processing wastes, Waste management.

Coastal marine waters, among the richest ecosystems in existence, are largely dependent upon nutrients of terrestrial origin. Where man has reduced or eliminated marshlands and river flow, urban sewage systems offer virtually the only nutrient source for sustaining diverse marine life. Studies at Terminal Island, California indicate that domestic sewage and fish-processing effluents supplied large organic molecules (proteins, amino acis, carbohydrates and fats) which enhanced the environment as they were recycled through the food chain or web. Methods were being developed for managing the levels of oxygen demand in the waste load, according to the assimilation capacity of the receiving waters, rather than destroying the nutrients by feeding only bacteria to secondary waste-treatment plants. The residual nutrients in the wastes after secondary treatment do not support the same diverse ecosystem, and depletion of after secondary treatment do not support the same diverse ecosystem, and depletion of biota may result. Rather, emphasis should be placed on point-source control and removal of toxicants without depriving the coastal organisms of their historic nutrient supply. In the future, energy-rich effluents should be used by developing alternative methods for waste management and new regulatory concepts, rather than imposing traditional secondary treatment. (NOAA)
W79-02164

UNDERGROUND INJECTION CONTROL PROGRAM STUDIED,
For primary bibliographic entry see Field 5G.
W79-02184

BARK AS A MEDIUM FOR GRAVITY DEWATERING OF SECONDARY SLUDGE FROM PULP AND PAPER MILLS,
Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W79-02186

DREDGE SPOIL IN MISSISSIPPI SOUND,
University of Southern Mississippi, Hattiesburg.
O. L. Paulson, Jr., C. M. Gross, J. C. Hovanesian, and R. J. Tarbutton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 706, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Institute, Mississippi State University, Mississippi State, Report October 1978. 38 p, 23 fig, 3 tab, 6 ref, 2 append. OWRT A-108-MISS(1), 14-34-0001-8026.

Descriptors: Dredging, Spoil, Channel improvements, Islands, Water circulation, Turbidity, Hydrography, Bathymetry, Tides, Streamflow, Wind, Sediment sampling, Sediment transport, Cores, Size, *Waste disposal, *Dredge spoil disposal, Gulfport(Miss), *Mississippi, *Mississippi Sound(Miss).

The disposal of 26.6 million cubic yards of dredged material to be removed during the proposed Gulfport Harbor expansion is the basis for studying existing dredge spoil deposits in Mississippi Sound and the physical processes acting upon these deposits. Sediment analysis of cores from dredge spoil near Gulfport was performed to determine physical properties of the spoil and to determine direction of sediment transport. Bathymetric data, tide data, wind data, streamflow data, current velocities, current directions and turbidity patterns from LANDSAT photos were used in determining physical factors affecting circulation and sediment transport in the Sound. Data from this study indicates that maximum turbidity within the Sound occurs during periods of high discharge from the rivers entering the Sound. Additional turbid conditions are produced over shallow areas by tides and wind-driven waves. Dredge spoil cores contained layers of medium grained sand with higher percentages of clay to the north and northwest. Layering is thought to be due to addition of spoil to existing spoil bank. These data, coupled with a study of historical changes in the configuration of Round Island, indicate that erosion would occur on the south and east side of dredge spoil banks or islands. Submarine prolongation could be expected on the north and northeast side of such a deposit. Orientation of future dredge spoil with this prevailing direction of sediment transport should serve to improve stability and reduce both original and maintenance costs.
W79-02188

LIQUEFACTION POTENTIAL OF HYDRAULIC FILLS,
Army Engineer District, Los Angeles, CA.
For primary bibliographic entry see Field 8D.
W79-02203

CYPRESS WETLANDS FOR WATER MANAGEMENT, RECYCLING AND CONSERVATION (THIRD ANNUAL REPORT, NOVEMBER 1, 1975 TO DECEMBER 15, 1976),
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02256

STRATIGRAPHY AND HYDROGEOLOGIC CORRELATION STUDIES IN SEVERAL CYPRESS DOMES-NORTH CENTRAL FLORIDA,
Florida University, Gainesville, Department of Geology.
D. P. Spangler, D. P. Gillespie, and J. D. Lundy.
In: Third Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p. 110-128, 1976. 9 fig, 13 ref.

Descriptors: *Swamps, Stratigraphy, *Waste water disposal, Wetland, Geologic mapping, Hydrogeology, Groundwater, Florida.

A stratigraphic study of several cypress domes suggests their viability as depositories for secondarily treated wastes, particularly where the Hawthorn clays (aquiclude) is present. A secondary conclusion resulting from this work has been the relationship of hardpans, dolomites, and phosphates to domal areas. These relationships are best noted in several presented cross sections, particularly those containing natural gamma radiation logs. Tentative correlations are possible between these data and the gamma logs. Further study is indicated and needed to describe the origin, movement, and deposition of iron, manganese, calcium, magnesium, phosphate, uranium, and randon with respect to cypress domes and their underlying groundwater systems. (See also W79-02256) (Steiner-Mass)
W79-02259

HYDROLOGY OF THE AUSTIN CARY CONTROL DOME,
Florida Univ., Gainesville. Dept. of Geology; and Florida Univ., Gainesville, FL. Center for Wetlands.
D. Gillespie.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p. 129-156, 1976. 9 fig, 3 tab, 10 ref.

Descriptors: *Swamps, *Hydrogeology, *Geologic mapping, *Waste water disposal, *Stratigraphy, *Florida, Wetlands, Hydrologic properties, Water balance, Hydrologic budget, Water table, Waste water, Aquifers, Permeability.

Hydrogeologic parmeters considered in examining the feasibility of using the Austing Cary Control cypress dome for water table management and recycling secondarily treated wastes include: permeability of the underlying materials, flow routes and rates of surface and/or groundwater, and ex-

change capacity or filterability of aquifers and aquicludes. Infiltration of treated wastes into the Floridan Aquifer is a main concern. Comparisons with two shallow aquifers and a secondary aquifer of the Hawthorn Formation reveals that recharge from surface waters and precipitation decreases with depth. The shallow surface aquifer is heavily influenced by surface water giving rapid responses. The shallow artesian aquifer is also influenced, but gives slower and diminished responses. Recharge to the secondary aquifer is minimal and shows a definite lag time. This is an indication that very little vertical groundwater movement would be expected down to the Floridan aquifer due to a thick sequence of impermeable clays separating it from the surface waters and precipitation. (See also W79002256) (Steiner-Mass)
W79-02260

EFFECT OF SEWAGE EFFLUENT IN CYPRESS PONDS ON SURROUNDING SOIL MOISTURE AND NUTRIENT CONTENT AND ON GROWTH OF PINE TREES (SUMMARY OF MS THESIS),
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02273

NITROGEN TRANSFORMATIONS IN WATER AND SEDIMENTS OF CYPRESS DOMES WITH AND WITHOUT ADDED SEWAGE EFFLUENT,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 2H.
W79-02276

THE EFFECTS OF PERTURBATION ON CYPRESS DOME ANIMAL COMMUNITIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02279

THE PROJECTED COST OF CYPRESS WETLAND DISPOSAL FOR WALDO, FLORIDA,
Florida Univ., Gainesville. Center for Wetlands.
J. Ordway.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville. p 803-811, 1976. 2 fig, 1 tab, 2 ref.

Descriptors: *Swamps, *Waste water disposal, *Cost analysis, Wetlands, Florida, Sewage.

The general costs for using cypress wetlands as recycling sites for secondarily treated sewage are considered for the city of Waldo, Florida. using one preliminary design, the total cost for this wetland treatment site was 42.2 cents per 1000 gallons compared with 62 cents per 1000 gallons for spray irrigation and 106 cents per 1000 gallons for advanced waste treatment. (See also W79-02256)(Steiner-Mass)
W79-02286

CYPRESS GROWTH RESPONSE IN A SEWAGE-ENRICHED POND CYPRESS ECOSYSTEM,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02287

INVESTIGATIONS OF HEAT TREATMENT FOR PAPER MILL SLUDGE CONDITIONING,
National Council of the Paper Industry for Air and Stream Improvement, Inc., Kalamazoo, MI. Central-Lake STates Regional Center.
D. W. Marshall, F. C. Fiery, and R. O. Blosser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 013, Price codes: Price codes: A00 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Protection Technology Series EPA-600/2-78-015, 85 p, February, 1978. 33 fig, 45 ref. 15 tab.

Descriptors: *Sludge treatment, *Pulp wastes, *Dewatering, *Heat treatment, Wastes, Industrial wastes, Sludge, Pulp and paper industry, Water pollution sources, Activated sludge, Biochemical oxygen demand, Color, Groundwood fines.

Heat treatment improved the filterability of groundwood fines and of waste sludges from the activated sludge treatment of pulp and paper mill waste waters. The improved filterability was related to the solubilization of volatile constituents up to an optimum solubilization of 40-60%. However, heat increased the BOD and color of the sludge filtrates. (Witt-IPC)
W79-02296

TREATMENT OF HIGH STRENGTH MEAT-PACKING PLANT WASTEWATER BY LAND APPLICATION,
Texas Univ. at Paso. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W79-02301

HANDLING AND DISPOSAL OF SLUDGES FROM COMBINED SEWER OVERFLOW TREATMENT. PHASE II - IMPACT ASSESSMENT,
Envirex, Inc., Milwaukee, WI. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W79-02303

METHOD OF TREATING A WASTE LIQUID CONTAINING POLLUTING COMPOUNDS,
For primary bibliographic entry see Field 5D.
W79-02324

PERIMETER DIKE RAISING WITH DEWATERED FINE-GRAINED DREDGED MATERIAL AT UPPER POLECAT BAY DISPOSAL AREA, MOBILE, ALABAMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
T. A. Haliburton, J. Fowler, and J. P. Langan.
Miscellaneous Paper D-78-3, August 1978. 66 p, 2 tab, 23 fig, 8 ref.

Descriptors: *Dewatering, *Dikes, *Dredged material, *Waste disposal sites, *Fine grained soils, *Polecat Bay(Ala).

Use of dewatered fine-grained dredged material for large-scale perimeter dike raising was evaluated by a cooperative field demonstration between the U.S. Army Engineer District, Mobile, and the Dredged Material Research Program (DMRP) Disposal Operations Project (DOP) and Productive Uses Project. After conduct of the field demonstration, it was determined: (1) Fine-grained dredged material of high plasticity may be used successfully in large-scale dredged material disposal site perimeter dike-raising activities, once the material has been successfully dewatered with DMRP DOP-developed procedures. (2) The cost of dike raising with the dewatered fine-grained dredged material was less than estimated for use of offsite borrow, even though the demonstration site had good haul access. (3) Three different methods for dewatered dredged material borrow removal and three different methods for perimeter dike raising were evaluated and found to be technically feasible and operationally practical. Corps of Engineers field elements and other interested agencies should seriously consider the use of dewatered fine-grained dredged material for large-scale perimeter dike-raising activities, following the construction procedures described and evaluated in the report. Such construction may be extremely cost effective at remote locations where offsite borrow is particularly expensive. (WES)
W79-02345

AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO; APPENDIX A: PLANKTONIC COMMUNITIES, BENTHIC ASSEMBLAGES, AND FISHERY,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
R. A. Sweeney.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-42, July 1978. 330 p, 36 tab, 119 fig, 101 ref, 3 append.

Descriptors: *Aquatic environment, *Lake Erie, *Ohio, *Benthic fauna, *Benthic flora, *Plankton, Fish, Biota, *Dredged material disposal, *Waste disposal sites, *Ashtabula River(Ohio).

An investigation to evaluate impacts of the release of dredged material on phytoplankton, zooplankton, benthic macroinvertebrates, and fish was conducted in Lake Erie off Ashtabula, Ohio, from June 1975 through September 1976. Samples and measurements were taken prior to, during, and after the release of materials from a hopper dredge during August 1975 and May 1976. Pelagic biota (phytoplankton, zooplankton, and fish) along with primary productivity were only mildly impacted and recovery was relatively rapid. The benthic communities were altered with the decline of some species and introduction of new fauna transported from the dredged sites. Within a year species diversity had largely returned to predisposal levels. However, the community structures were slightly altered. These changes were similar to those noted in marine environments exposed to dredged material. (WES)
W79-02346

ABILITY OF SALT MARSHES TO REMOVE NUTRIENTS AND HEAVY METALS FROM DREDGED MATERIAL DISPOSA AREA EFFLUENTS,
H. L. Windom.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-37, December 1977. 100 p, 7 tab, 12 fig, 25 ref, 5 append.

Descriptors: *Salt marshes, *Nutrients, *Heavy metals, *Pollutants, *Effluents, *Dredged material disposal, *Waste disposal sites.

Experimental raceways were constructed in a salt marsh adjacent to a dredged material confinement area to evaluate use of this environment as an overland flow advanced treatment system for effluent resulting from dredged material disposal. The program was designed to determine the ability of salt marsh systems to remove nitrogen, phosphorus, iron, manganese, cadmium, copper, nickel and zinc from effluent. Application rates varied between 0.06 and 3.7 acre inches per day and concentrations of the contaminants were determined in the effluent from the disposal area and discharge from the experimental system. All contaminants were found to decrease in the effluent as it passed through the experimental raceways. Removal efficiencies for nitrogen and phosphorus varied up to 50 and 70 percent, respectively. Mean metal removal efficiencies ranged between 15 and 32 percent. Efficiency of removal appeared unrelated to application rate but did appear toincrease with concentration. Contaminants accumulated in sediments with only minor increases in salt marsh vegetation. Although resuls indicate nutrients and heavy metal concentrations in effluents from dredged material disposal areas can be reduced during passage through a salt marsh, conclusions about efficiency or removal may be influenced by the size of the experimental system used. (WES)
W79-02347

FLUME EXPERIMENTS ON SAND, SILT, AND CLAY MIXTURES FROM THE OFFSHORE DREDGED MATERIAL DISPOSAL SITE, GALVESTON, TEXAS,
Texas A and M Univ., College Station. Dept. of Oceanography.
A. J. Moherek.
Army Engineer Waterways Experiment Station,

Vicksburg, Mississippi, Technical Report D-78-34, June 1978. 204 p, 6 tab, 66 fig, 42 ref, 6 append.

Descriptors: *Texas, *Gulf of Mexico, *Flumes, *Sediment transport, *Dredged material disposal, *Waste disposal sites, *Galveston(Tex).

Flume experiments were performed on four sediment mixtures sampled from the offshore Galveston dredged material disposal site in order to determine their critical erosion velocity, shear stress, and modes of sediment transport. Also, and analysis of the offshore Galveston hydrographic regime was performed using meteorologic and oceanographic data. Results indicated the four sediment mixtures eroded similarly. Extapolation of flume results to recorded off-shore bottom current speed measurements indicate bedload erosion occurs much more frequently near the northern margin of the disposal site. Also, net bedload transport of disposal material is oriented down the coast or offshore from the disposal site, suggesting that material will not likely return to the channel proper as shoaling sediment. (WES)
W79-02348

AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON, EVALUATIVE SUMMARY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5C.
W79-02350

EXPERIENCE WITH DRUM DRYERS FOR ACTIVATED SLUDGE (OPYT NALADKI BARABANNYKH SUSHILOK AKTIVNOGO ILA),
D. A. Narinskii.
Bumazhnaya Promyshlennost', No. 4, p 30-31, April, 1978. 1 fig, 1 tab.

Descriptors: *Activated sludge, *Sludge treatment, *Drying, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Foreign countries, Pulp wastes, Pulp and paper industry, Sludge, Equipment, Drum dryers.

Progress-brand drum dryers have been installed at several Soviet paper mills for drying excess activated sludge (dewatered on vacuum filters to 80-85% moisture content) to a moisture content of 30-40%. However, the standard nozzles did not break up the sludge sufficiently, resulting in a low drying efficiency. Progress-brand dryers installed at the Arkhangel'sk mill were studied and reconstructed. The reconstructed dryers operate satisfactorily: the dried sludge has a moisture content of 20-40%, and the dryer efficiency is 60-70 kg water/cu m/hr at a heat consumption of 950-1,000 kcal/kg of evaporated water. It is pointed out that the use of the dryers can be economically justified only if the dried sludge is subsequently burned with recovery of heat. (Stapinski-IPC)
W79-02385

QUANTITATIVE MAPPING BY REMOTE SENSING OF AN OCEAN ACID-WASTE DUMP,
National Aeronautics and Space Administration, Hampton, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W79-02407

ANALYSIS OF THE ENVIRONMENTAL CONTROL TECHNOLOGY FOR OIL SHALE DEVELOPMENT,
Utah Univ., Salt Lake City. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W79-02432

A STATISTICAL EVALUATION OF SOME COLUMBIA RIVER BASALT CHEMICAL ANALYSIS,
Atomics International Div., Richland, WA. Rockwell Hanford Operations.
For primary bibliographic entry see Field 5A.
W79-02433

ASSESSMENT OF HAZARDOUS WASTE PRACTICES IN THE PETROLEUM REFINING INDUSTRY,
Jacobs Engineering Co., Pasadena, CA.
For primary bibliographic entry see Field 5D.
W79-02440

HAZARDOUS WASTE DISPOSAL DAMAGE REPORTS, DOCUMENT NO 2.
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 155, Price codes: A02 in paper copy, A01 in microfiche. Report No EPA/530/SW-151.2, December 1975. 20 p, 9 ref.

Descriptors: *Waste disposal, *Environmental effects, *Public health, Publications, Water pollution, Water pollution effects, Soil contamination, Oil wastes, Missouri, Colorado, Texas, Chemical wastes, Groundwater, Ponds, Industrial wastes, Sand pits, Surface waters, Water wells.

Three incidents of improper land disposal of hazardous wastes are documented as part of an investigation to determine the impact of such practices on public health and on the environment. The incidents reported are: (1) the spraying of dioxin-contaminated waste oil on three horse arenas and a farm road in Missouri in May and June 1971; (2) the disposal of chemical wastes in unlined ponds between 1943 and 1957 causing contamination of groundwater beneath the Rocky Mountain Arsenal and surrounding area between Denver and Brighton, Colorado; and (3) the disposal of acidic and oily industrial wastes into an unlined, abandoned sand pit in Crosby, Texas, between the mid-1960s to 1971 causing contamination of ground-and surface waters which affected domestic wells. (Gibson-IPA)
W79-02443

ADSORPTION OF POLIOVIRUS TYPE I TO WASTEWATER TREATMENT PLANT SOLIDS,
California Univ., Los Angeles. Dept. of Chemical, Nuclear and Thermal Engineering.
For primary bibliographic entry see Field 5D.
W79-02446

VIRUS TRANSPORT THROUGH SOLID BEDS,
California Univ., Los Angeles. Dept. of Chemical, Nuclear and Thermal Engineering.
For primary bibliographic entry see Field 5B.
W79-02447

EFFECTS OF BURIAL ON THE HEART COCKLE CLINOCARDIUM NUTTALLII AND THE DUNGENESS CRAB CANCER MAGISTER,
Fisheries and Marine Service, West Vancouver (British Columbia).
For primary bibliographic entry see Field 5C.
W79-02472

THE EFFECT OF SILT-FENCE ON THE PREVENTION OF SEA WATER SILTATION CAUSED BY DREDGING AND RECLAIMING WORK IN HARBOR, (IN JAPANESE),
Hokkaido Regional Fisheries Research Lab. (Japan).
For primary bibliographic entry see Field 5C.
W79-02481

5F. Water Treatment and Quality Alteration

COPPER SULFATE HELPS CONTROL MICORGANISMS IN RESERVOIRS,
S. B. Tuwiner.
Water and Sewage Works, Vol. 123, No. 12, p 68-70, December 1976. 20 ref.

Descriptors: *Water treatment, *Copper sulfate, *Reservoirs, *Algae, Pre-treatment(Water), Eutrophication, Chlorination, Water purification, Hypochlorite, Water pollution control.

There is a general increase in organic matter in potable water derived from discharges and biosynthesis in surface water supplies and from plankton in reservoirs. This organic matter is treated with chlorine and hypochlorite which produces chlorinated organics potentially dangerous to health. Copper sulfate added to reservoirs prevents algal growth ad thereby reduces the amount of organic matter that would otherwise be subject to chlorination. The combined objective of water purification should be: (1) to provide treatment plus pre-treatment, (2) to minimize the final chlorine demand, and (3) to provide free chlorine in post-treatment. Copper sulfate is used to prevent the synthesis of organic matter by algae and to reduce filter clogging; filters may then more effectively remove organics and reduce turbidity. Copper sulfate is also protective against certain carcinogens. While there is no evidence that the compound has this protective effects in water it would be unwise to eliminate copper sulfate treatment until its lack of uselfulness against carcinogens in water is proven. (Harris-Wisconsin)
W79-02018

THE PROJECTED COST OF CYPRESS WETLAND DISPOSAL FOR WALDO, FLORIDA,
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5E.
W79-02286

WATER PURIFIER,
Teledyne Industries, Inc., Fort Collins, CO. (Assignee).
T. E. Corder.
U.S. Patent No. 4,107,046, 16 p, 22 fig, 29 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1250, August 15, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Filtration, Flow control, Filters.

A filter cartridge, for an internally by-passable water purifier apparatus, is in the form of a tubular shell that has inlet and outlet walls with at least one opening being defined in each. A water filtering material is placed within the shell. Running lengthwise of the shell is an arrangement for guiding water from the inlet to the outlet regions and exclusive of the filtering material. That arrangement is either interiorly of or external to the shell. The cartridge is usable in a purifier apparatus that has a housing with an inlet for the flow of water as well as a single outlet area for discharging the flow of water. A channel defines the path of water flow from the inlet to the outlet, and a chamber is defined in that channel in the path of the flow. One valve in the channel controls the flow of water from the inlet through the cartridge to the outlet. In addition, another valve controls the flow of water from the inlet to the outlet along a path that by-passes the cartridge. (Sinha-OEIS)
W79-02308

HOME WATER DISTILLER,
F. C. Kirschman, and W. B. Bolte.
U.S. Patent No. 4,110,170, 7 p, 5 fig, 19 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2297, August 29, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, *Distillation, Condensation, Condensers, Temperature, Domestic water, Distiller.

A home distiller provides for an efficient distillation process. The inlet water supply is controlled as a function of the temperature of the output of the distiller and the inlet water is preheated by introducing it inot a chamber surrounding the condensor coils. After preheating, the water flows into the boiling chamber. The unit is provided with a flow-through or constant-flush drainage system to

keep mineral buildup to a minimum, and to provide for automatic control of the input water. (Sinha-OEIS)
W79-02319

METHOD FOR TREATING A MEDIUM CONTAINING WATER WITH COAGULANTS,
For primary bibliographic entry see Field 5D.
W79-02322

REVERSE OSMOSIS WATER UNIT,
P. D. Maples.
U.S. Patent No. 4,110,219, 6 p, 9 fig, 11 ref; Official Gazette of the United States Patent Office, Vol. 973, no 5, p 2313, August 29, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Reverse osmosis, Domestic water, Membrane processes, Activated carbon.

A portable water container for holding water treated by reverse osmosis water purification rests on a base. The base has a recess in which the reverse osmosis unit is laid. Water is supplied to the portable water container and an overflow is provided. The reverse osmosis unit can be quickly and easily removed from the base by merely lifting the osmosis unit from the recess and pulling stopper type end connectors from the ends. The walls of the recessed portion of the base restrains movement of the stopper end connectors from the osmosis units during use. The reverse osmosis unit also has activated carbon impregnated paper through which the water passes providing further water treatment. (Sinha - OEIS)
W79-02329

WATER TREATMENT APPARATUS AND METHOD,
Societe Degremont Paris (France). (Assignee).
R. Louboutin.
U.S. Patent No. 4,111,802, 12 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 1, p 329, September 5, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water pollution treatment, Separation techniques, Mixing, Flocculation, Chemical precipitation, Crystallization.

A method and apparatus for treating water by flocculation and/or cyrstalline-precipitation type treatments is described. The invention is particularly suitable for treating water which is charged or saturated with inorganic salts that can be precipitated in the form of a crystalline sludge by means of known chemical reagents with which they form compounds of low solubility. A single enclosure includes a reaction zone and a decanting zone. Water to be treated is introduced into the bottom of the reaction zone. A pump turbulently mixes the dwater and sludge within a turbulent area and passes the resultant mixture through a central passage at a rate several times higher than the rate at which the water is introduced into the reaction zone. A first portion of the mixture is recycled back into the turbulent area. A second portion of the mixture, including a relatively high concentration of sludge, is distributed to the bottom of the decanting zone, at a flow rate and at a pressure sufficient to ensure that the mixture of sludge and water will be distributed uniformly throughout the entire area of the lower portion of the decating zone. The purified water passes upward through the decanting zone and is collected. The sludge settles downward to the bottom ofthe decating zone and is returened to the turbulent area of the reaction zone. (Sinha - OEIS)
W79-02333

NOVEL COMPOSITIONS OF MATTER FOR USE IN THE TREATMENT OF AQUEOUS SYSTEMS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
P. Miles, N. Richardson, and M. A. Finan.
U.S. Patent No. 4,111,804, 7 p, 2 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 329-330, September 5, 1978.

Descriptors: *Patents, *Water treatment, *Scaline, *Water quality control, Desalination, Industrial water, Hardness(Water), Chemical precipitation, Calcium compounds, Magnesium, Organic compounds, Telmers.

A method is provided for inhibiting scale formation by salts of calcium, magnesium, barium and strontium from aqueous solutions over a wide range by adding to the aqueous solution a minor proportion of the product comprising a telomer. The telomeric compounds show good control of calcium carbonate, calcium sulphate and magnesium hydroxide scales and more importantly modify the crystal structure of the scale so that it is non-uniform and easily removable. (Sinha-OEIS)
W79-02335

EVALUATION OF SEMIPERMEABLE MEMBRANES FOR CONCENTRATION OR ORGANIC CONTAMINANTS IN DRINKING WATER,
Gulf South Research Inst., New Orleans, LA.
For primary bibliographic entry see Field 5A.
W79-02405

COMPARISON OF METHODS FOR THE DETERMINATION OF TOTAL AVAILABLE RESIDUAL CHLORINE IN VARIOUS SAMPLE MATRICES,
Environmental Monitoring and Support Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W79-02412

TREATMENT EFFECTIVENESS FOR THE REMOVAL OF SELECTED CONTAMINANTS FROM DRINKING WATER,
Stone (Ralph) and Co., Inc., Los Angeles, CA.
J. R. Marsh, H. Y. Hsu, and M. Kilinger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 271 Price codes: A09 in paper copy, A01 in microfiche. Final Report, March 1975. 197 p, 100 fig, 7 tab, 198 ref, 1 append. 68-01-2692.

Descriptors: *Water treatment, *Water pollution treatment, *Pesticide removal, *Potable water, Coagulation, Distillation, Filtration, Ion exchange, Chemical degradation, Polychlorinated biphenyls, Hazardous wastes, Trace elements, Radiation, Effluents, Influents, Associated costs, Carbon, Adsorption, Lime, Oxidation chemical precipitation, Electrodialysis, Reverse osmosis, Beryllium, Chlorinated hydrocarbon pesticides, Cobalt, Lithium, Antimony, Bis-ethers, Molybdenum, Nickel, Organophosphorus pesticides, Tungsten, Vanadium.

A literature search was initiated to summarize and evaluate all available data on removing the following hazardous substances from drinking water: antimony, beryllium, cobalt, lithium, molybdenum, nickel, tungsten, vanadium, bis-ethers, polychlorinated biphenels, chlorinated hydrocarbon insecticides, and organophosphorus insecticides. The characteristics of each contaminant are listed, and include: natural and industrial sources and uses; occurrence in drinking water supplies; toxicology; and a list of treatment and removal methods. Each treatment method is described separately in regard to process theory, process configurations and design, general and specific applications, and process economics. The processes discussed are adsorption, chemical oxidation, coagulation/precipitation, distillation, electrodialysis, ion exchange, radiochemical degradation, reverse osmosis, and ultra filtration. It is concluded that the best currently available method for treating all organic contaminants is activated carbon adsorption; inorganic contaminants can best be treated by lime coagulation. (Davison-IPA)
W79-02435

ASBESTOS IN THE WATER SUPPLIES OF THE TEN REGIONAL CITIES, PART I,
McCrone Research Inst., Chicago, IL.
For primary bibliographic entry see Field 5A.
W79-02441

5G. Water Quality Control

THE EFFECTS OF WEED-CUTTING ON THE MACRO-INVERTERATE FAUNA OF A CANALISED SECTION OF THE RIVER HULL, A NORTHERN ENGLISH CHALK STREAM,
James Cook Univ. of North Queensland, Townville (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-02002

AQUATIC PLANT MANAGEMENT IN SEMI-NATURAL STREAMS: THE ROLE OF MARGINAL VEGETATION,
Freshwater Biological Association, East Stoke (England). River Lab.
F. H. Dawson.
Journal of Environmental Management, Vol. 6, No. 3, p 213-221, May, 1978. 4 fig, 17 ref.

Descriptors: *Vegetation establishment, *Aquatic weed control, *Trees, *Water management(Applied), *Streams, *Mechanical control, England, Aquatic plants, Shade, Canopy, Fisheries, Sport fishing, Light, Chalk streams, Streamflow, Flood control, Drainage, Vegetation regrowth, Plant growth, Life cycles, Water supply.

Control of aquatic plants in streams (particularly in English chalk streams) by mechanical removal or by shading through planting of trees along the bank is evaluated, and the latter is recommended as a good ecological technique. Trees planted on the north bank will reduce light to a lesser degree than south-bank trees, but will decrease flood risk without reducing the total organic input, including leaf fall. If organic input is already sufficient or excessive, trees should be planted on the south bank to reduce total organic input. The tree line should include gaps to allow for areas of plant growth, which are necessary for fish and invertebrate cover, provide a source of oxygen to the water, and help retain leaf fall evenly. Deciduous trees should be chosen to allow some overwinter growth of aquatic plants and provide a canopy more suitable for machine and dry fly fishing. Costs of tree planting are about the same as plant removal. While plant removal temporarily reduces the risk of flooding, subsequent plant growth is both vigorous and synchronized. Plant growth synchronization causes maximum biomass to coincide over the whole population, and streamflow restriction is actually intensified. In addition, managed streams tend to become trapezoidal channels with only transient patches of sediment, whereas natural streams with stable sediment patches have riffles and pools favorable to fish and invertebrates. Plant removal either earlier in the spring or in late all might achieve better control. (Lynch-Wisconsin)
W79-02012

COPPER SULFATE HELPS CONTROL MICORGANISMS IN RESERVOIRS,
For primary bibliographic entry see Field 5F.
W79-02018

EPA'S CONSTRUCTION GRANTS PROGRAM: PERSPECTIVES COSTS,
Environmental Protection Agency, Washington, DC.
D. M. Costle.
Pollution Engineering, Vol. 10, No. 9, p 40-43, September 1978.

Descriptors: *Grants, *Construction grant program, *Treatment facilities, *Waste water treatment, *Construction costs, *Financing, *Federal Water Pollution Control Amendments of 1977, *Regulation, Environmental Protection Agency, Federal government, Costs, Construction, Legislation, Institutional constraints, Sewage treatment, Waste treatment, Municipal wastes, Operation and maintenance, Tertiary treatment, Economic impact, Local governments, Cost-benefit analysis, Planning, Decision making, Use rate, Policy, Cost-effectiveness.

A description of EPA's construction grants program for waste treatment facilities, emphasizes costs and benefits of advanced waste treatment (AWT) and overall financial impact of the construction program on local communities. A realistic estimate of needs for AWT facilities is $1.5-2.0 billion, covering the cost of plants for total nitrogen removal or achievement of BOD limitations of less than 10 mg/l. A review of 6500 projects shows only 330 will require treatment to achieve these levels. In some cases AWT is mandated by state requirements, but costs of compliance may exceed benefits. The Vertex study, commissioned by EPA, indicated many AWT projects carried out with inadequate planning and justification resulted in excessive expenditures and insufficient compensating benefits. Improved monitoring is needed at the state level. Over 65% of the grants have gone to communities of 10,000 or less, many of which are experiencing financial problems. In 40% of the communities, operation and maintenance plus debt retirement for new facilities will cost over $100/household/year. An expensive treatment system is one in which such costs are 1.5-2.5% of local median income, the case in 10-20% of these communities. Several provisions of the 1977 amendments to the Water Pollution Control Act address these problems, providing more assistance, allowing more flexibility, and removing some of the paperwork. Five of the provisions are discussed. (Lynch-Wisconsin)
W79-02027

OVERSEAS MARKETS FOR THE WATER INDUSTRY - NIGERIA,
M. A. Kershaw.
Effluent and Water Treatment Journal, Vol 18, No 8, p 397-401, August 1978. 8 ref.

Descriptors: *Nigeria, *Marketing, *Water pollution control, *Waste water treatment, *Treatment facilities, *Export, *International trade, *Great Britain, Consulting firms, Engineering, Economics, Economic feasibility, Water supply, Water reuse, Water delivery, Water conservation, Developing countries.

Opportunities for British consulting engineering firms to obtain overseas contracts for water supply, treatment, distribution, conservation, and reuse, wastewater treatment, and water pollution prevention are discussed, with particular reference to Nigeria. Nigeria, under military rule since 1967, is expected to revert to civil government in 1980. Oil production provides almost 95% of foreign exchange, and is expected to last for some 30 years. The cost of the Third Development Program, to be completed in 1980, is estimated at 40 billion U.K. pounds. The project includes water treatment and distribution, sewerage, and wastewater treatment. In most urban centers, the only modern wastewater treatment facilities are located at hospitals, military installations, new universities, and individual factories; many such plants are nonfunctional or functioning poorly, mainly due to lack of trained operators. Major opportunities for foreign firms will be in construction and capital plant. Governments of developing countries typically invite consulting engineers, either directly or through an international agency, to submit a feasibility study, and later a detailed proposal, for acceptance. Useful background information on the prospective country can be obtained from the Ministry of Overseas Development. A senior member of a successful firm may make frequent visits to the country to secure contacts. (Lynch-Wisconsin)
W79-02030

COEFFICIENTS OF POLLUTION: INTERINDUSTRY LINKAGE AND POLLUTION IN BELGIUM,
State Univ. of New York at Binghamton. School of Management.
M. Chatterji.
Environmental Management, Vol. 2, No. 4, p 300-312, July 1978. 11 tab, 8 ref.

Descriptors: *Belgium, *Netherlands, *United States, *Pollution coefficients, *Pollution abatement, *Methodology, Pollutant identification, Analytical techniques, Economics, Environmental economics, Industrial wastes, Input-output analysis, Air pollution, Water pollution, Pollutants, Classification.

A technique is presented for using pollution coefficients derived from data collected in one country for economic analysis of a similar country for which data are unavailable. In this paper data for the Netherlands (Den Hartog and Houweling, 1974) and the United States (Leontief and Ford, 1972) yield pollution coefficients subsequently combined with input-output data prepared for Belgium by the National Institute of Statistics in 1970. Results provide crude estimates of the amount of direct and indirect air and water pollution generated from production of a unit of activity in different sectors of the Belgian economy. With this method considerable data collection expense is avoided, though results clearly are only indications since industrial mix and state-of-technology vary between countries. The input-output data consists of 93 industrial classifications, reduced to 53 in this study. Pollution coefficients obtained for the United States and the Netherlands cannot be directly compared because different pollutant classifications are used. Five pollutant types are identified in the U.S. study: particulates, sulfur oxides, hydrocarbons, carbon monoxide, and nitrogen oxides. The classification for the Netherlands data are: public water pollution, private water pollution, sulfur pollution from gas oil, sulfur pollution from residual oil, solid waste, pollution from automobiles, and pollution from trucks and vans. All coefficients are given in tables. (Lynch-Wisconsin)
W79-02031

THE CHOICE OF EFFICIENT POLLUTION POLICIES: TECHNOLOGY AND ECONOMICS IN THE CONTROL OF SULPHUR DIOXIDE,
London School of Economics and Political Science (England).
A. Marin.
Journal of Environmental Economics and Management, Vol 5, No 1, p 44-62, 1978. 1 tab, 40 ref.

Descriptors: *Regulation, *Sulfur dioxide, *Air pollution, *Pollution abatement, *Technology, Economics, *Pollution taxes(Charges), *Standards, Water pollution control, Damages, Optimization, Emission standards, Monitoring, Heavy metals, Pollutants, Rivers, Input-output analysis, Sulfur, Information.

Reexamination charges vs. regulations for pollution control, with sulfur dioxide as a case study, shows that charges are not always preferable to regulations, and the choice depends on the specific pollutant. Charges would seem more suitable for river pollution than for control of sulfur dioxide--with the exception of initial sewage generation--in terms of several issues: (1) damage functions and optimality, (2) spatial uniformity, (3) number of polluters, (4) monitoring of emissions, (5) relationship between inputs and emissions, and (6) iterations and exactness. Major provisos are problems of monitoring emissions of oxygen-depleting waste, and the necessity of keeping heavy metal contamination of food to acceptable levels. For sulfur dioxide, charges are only practical when levied on the fuel, because of the expense of monitoring emissions and because sulfur inputs equal sulfur dioxide output. Though a tax on fuel sulfur content (with certain exceptions) might be best for reducing all emissions, the inefficiency of attempting this would probably instead lead to a preference for quantitative limits in an effort to achieve acceptable ambient concentrations and to single out worst offenders. This paper presents a technological summary of sulfur dioxide as a pollutant, discusses informational requirements of alternative policies, and compares continuous monitoring with spot checks. (Lynch-Wisconsin)
W79-02038

COORDINATING PUBLIC UTILITY EXPANSION, INDUSTRIAL SITING AND POLLUTION CONTROL: A WORKING DYNAMIC PROGRAMMING ALGORITHM,
California Univ., Riverside. Dept. of Economics.
M. Sheehan, and K. C. Kogiku.
Socio-Economic Planning Sciences, Vol 11, No 6, p 331-338, 1977. 1 fig, 4 tab, 13 ref.

Descriptors: *Algorithms, *Dynamic models, *Public utilities, *Industries, *Pollution abatement, *Wastewater treatment, *Sites, *Planning, Mathematical models, Model studies, Land use, Economic development, Alternative planning, Decision making, Water pollution control, Air pollution, Welfare(Economics), Economics, Computer programs, Sewage treatment, Electric power demand, Trade-offs, Iteration.

A tactical planning method facilitates formulation of a joint plan for public utility capacity management, air and water pollution control, and choice and staging of industrial development in an area. Two mathematically uncomplicated models are linked through an iterative process which obviates computational difficulties usually associated with large-scale dynamic programming formulations. A point system is used in conjunction with data on the estimated impact of the industrial project on municipal and special district revenues, employment, demand for housing, and the like, to yield a measure of gross benefits for each applicant firm. Gross benefits are then combined with utility costs to determine net benefits. Firms violating pollution regulations or having negative net benefits are eliminated, at least temporarily, and a distribution-of-effort algorithm is used to choose among remaining firms. A finite-horizon regenerating model determines the optimal long-run capacity construction plan. An iterative procedure sets the final mix of all components. Use of the method as a fully operational direct planning tool would require centralizing all long-range planning responsibilities into one agency invested with permit power over industrial ingress. Types of required data include: (1) a description of each applicant firm, (2) utility expansion costs, and (3) pollution costs. (Lynch-Wisconsin)
W79-02039

THE LIMITED APPLICABILITY OF MARSHALLIAN ECONOMICS TO THE PROBLEM OF POLLUTION ABATEMENT: A SUGGESTED ALTERNATIVE,
Indiana Univ. at South Bend. Dept. of Economics.
P. Kochanowski, J. G. Witte, and B. Henneberry.
Journal of Economics and Business, Vol 30, No 3, p 219-223, 1978. 1 tab, 12 ref.

Descriptors: *Economics, *Mathematical models, Analytical techniques, Partial equilibrium models, General equilibrium models, *Pollution taxes(Charges), *Regulation, *Pollution abatement, Optimization, Equilibrium, *Model studies, Welfare(Economics), Methodology, Estimation.

Mathematical analysis shows that the partial equilibrium method may result in systematic underestimation of socially optimal effluent charges by as much as 50%. The Marshallian ceteris paribus limits the applicability of partial equilibrium results, especially in the implied neglect of systematic feedbacks on relative output prices and quantities of changes in relative factor prices induced by the charges themselves. This negligibility is demonstrated by applying sensitivity analysis to optimal pollution tax rates determined in the context of a two-sector general equilibrium model. The analysis comprises four steps: (1) marginal conditions derived from a Bergson-type welfare function lead to a general statement of optimal tax rates; (2) optimal tax rates determined with and without impact of the tax on input markets lead to the difference between partial and general equilibrium tax rates as a function of rates of change in prices of capital and labor with respect to the tax; (3) solution for rates of change in prices of capital and labor from a two-sector, two-factor general equilibrium model leads to the difference between partial and general equilibrium tax rates as a function of the characteristics of polluting and nonpolluting sectors; and (4) estimates of these characteristics for the general equilibrium system lead to estimates of the direction and magnitude of the difference between partial and general equilibrium tax rates. Four situations are identified in which Marshallian

and general equilibrium tax rates are identical. (Lynch-Wisconsin)
W79-02041

THE BUSINESS OF POLLUTION CONTROL - A BED OF ROSES OR THORNS.
Pollution Engineering, Vol 10, No 7, p 32-44, 1978. 1 fig, 2 tab.

Descriptors: *Pollution abatement, Equipment, *Technology, *Research and development, *Air pollution, *Water pollution control, Federal Water Pollution Control Act Amendments of 1972, Environmental Protection Agency, Demand, Federal government, Attitudes, Surveys.

Results of a questionnaire sent to 4000 manufacturers of pollution control equipment and components requesting opinions on a variety of topics relating to the industry are presented, and representatives of 20 equipment manufacturers provide personal views on problems of the pollution control market. Several agencies were rated according to their degree of support for pollution control products: EPA was rated by 68% of respondents as helpful and by 32% as not helpful or a hindrance, Commerce Department 51% and 49%, Energy Department 41% and 59%, Interior Department 36% and 64%, President's Council on Environmental Quality 28% and 72%, and H.E.W. 26% and 74%. Respondents considered an average of 45% of their own products as innovative, and companies spend an average of 10.1% of total sales on new equipment research. About 46% of manufacturers believe there will be long term growth in the market, 27% that the market will grow in the short run and then level off, 8% that the market will decline after 1985, and 16% that there will be a change from providing products to providing services. Regarding the best approach to environmental protection, 40% feel a coordinated international approach would be better than the present system; other suggestions include more use of cost-benefit analysis and for EPA to employ personnel who are more technically qualified and less political. About 41-44% feel EPA has stifled new product development or discouraged engineers from trying and specifying new products. (Lynch-Wisconsin)
W79-02044

ECONOMETRIC ANALYSIS OF ENVIRONMENTAL POLICY: ESTIMATION OF A MODEL OF THE CANADIAN PULP AND PAPER INDUSTRY,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 6B.
W79-02046

STABLE TAXATION SCHEMES IN REGIONAL ENVIRONMENTAL MANAGEMENT,
Centro Teoria dei Sistemi, Milan (Italy).
S. Rinaldi, R. Soncini-Sessa, and A. B. Whinston.
International Institute for Applied System Analysis, Luxemburg, Research Report 77-10, May 1977. 45 p, 9 fig, 7 ref, 1 append.

Descriptors: *Pollution taxes(Charges), *Economics, *Pollution abatement, *Water pollution control, *Stability, *Economic efficiency, *Regional economics, *River basins, Water management(Applied), Externalities, Model studies, Mathematical models, Game theory, Water quality standards, Optimization, Cost-benefit analysis, Damages, Waste water treatment, Waste water disposal, Effluents, Institutional constraints, Political constraints, Economies of scale, Damage functions, Public benefits.

Simple game theory is used to analyze the stability and efficiency of regional pollution tax schemes, focusing on water pollution control in a river basin. Stability (where users have no incentive to reject the plan) and efficiency can be attained by permitting the regional authority to sell emission rights for profit, with higher profit necessary with increasing environmental congestion. In the absence of profit, social benefits cannot be maximized without generating friction among the polluters. Efficiency and stability are easily attainable if environmental damage is ignored, that is, if total benefit of firms rather than social benefit is maximized. Such a situation, which has characterized the course of industrialization throughout the world during the past century, is no longer tolerable. Three classes of abatement schemes are evaluated: (1) Effluent standards are imposed by law on each firm, and wastewater treatment is handled by a regional authority with cost recovery through apportionment of costs among users based on residuals of each firm. (2) Pollutant removal standards are legally imposed, with taxes on waste production. (3) Effluent charges are levied; stable taxation schemes only exist where firms realize high profits. The analytical model considers two basic institutional arrangements, treatment plants owned and operated by producers, or plants operated by a regional authority. (Lynch-Wisconsin)
W79-02051

NATURAL RESOURCES AND ENVIRONMENTAL RESTRICTIONS TO GROWTH,
Harvard Univ., Cambridge, MA.
For primary bibliographic entry see Field 6G.
W79-02056

PRICING AND STANDARDS IN THE CONTROL OF POLLUTION,
York Univ. (England).
M. Ricketts, and M. G. Webb.
Scandinavian Journal of Economics, Vol 80, No. 1, p 53-61, 1978. 2 fig, 6 ref.

Descriptors: *Pricing, *Standards, *Pollution taxes(Charges), *Regulation, *Timing, Policy, Air pollution, Water pollution control, Governments, Costs, Marginal costs, Model studies, Mathematical models, Political constraints, Optimization.

Where a government wishes to control the timing as well as the standards of pollution abatement, and where costs are influenced by both abatement level and timing, no single tax may produce a politically acceptable outcome. To achieve the latter (at least cost) may require a complex tax structure. In certain circumstances, however, the combination of a central directive requiring abatement by a given date and a single Baumol-Oates type of post-abatement would lead to efficient results with a simpler structure. The analysis is based on the observation that: (1) the choice of a particular tax rate on emissions determines not only the abatement level but also the time of abatement, and (2) setting the optimal tax at a level equal to an industry's long-run marginal costs of abatement raises the question of which long-run marginal cost function is relevant. The model used assumes that society has determined the acceptable abatement standards and time limits. Other conclusions are that: (1) where different firms have unequal abatement cost functions the tax solution requires that a different tax rate be applied to every firm; and (2) the relevant concept of the long-run relates to the acceptable level of delay, and the optimal tax should be imposed after this time has elapsed. (Lynch-Wisconsin)
W79-02057

A POLLUTED GOLDEN AGE,
Chicago Univ., IL.
W. A. Brock.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, N.Y., p 441-461, 1977. 21 ref.

Descriptors: *Economics, *Economic growth, *Pollution abatement, *Mathematical models, *Club of Rome, Costs, Equilibrium, Model studies, Cost-benefit analysis, Capital, Externalities, Interest rates, Optimization, Utility, Pollution taxes(Charges), Marginal costs, Discount rates.

An economic growth model is presented which includes pollution costs, and its use in analyzing current environmental issues is demonstrated regarding the Club of Rome report. The report basically contends that continuation of population growth, pollution productions, and energy consumption at current or even lower rates will essentially cause society to collapse. Critics argue that the report ignores the role of the price system in holding down energy usage. This paper discusses: (1) the model; (2) how growth theory relates to equilibrium theory, with emphasis on externality taxes; (3) biases in the observed market rate of interest when pollution is accounted for (important in discounting future benefits in cost-benefit analysis); and (4) use of such models in building a theoretical apparatus for discussion of issues raised in the Club of Rome report, focusing on whether free enterprise has a self-corrective mechanism to avoid a development vs. pollution catastrophe. It is shown that if a pollution tax is set equal to the marginal social cost of polluting, then competitive equilibrium internalizes the externality which produces the optimal amount of goods and pollution. (Lynch-Wisconsin)
W79-02071

OPTIMAL CONFIGURATION OF THE COOLING SYSTEM FOR POWER GENERATION,
Kansas Water Resources Research Inst., Manhattan; and Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
L. T. Fan, S. H. Lin, R. Shojalashkari, and C. L. Hwang.
Contribution No. 149. In: Energy Sources, Vol. 1, No. 4, p 401-422. 1974. 10 fig, 17 ref. OWRT B-037-KAN(4), 14-31-0001-4086.

Descriptors: *Cooling towers, Water pollution control, Investment, System synthesis, *Optimal cooling systems, *Power generation, *Cooling ponds, Direct discharge subsystem, Structural parameter method, Generalized reduced gradient method.

The purpose was to apply a system-synthesis technique to the determination of the optimal cooling system for power generation. The cooling system was assumed to consist of a cooling tower, a cooling pond, and a direct-discharge subsystem. The optimal cooling system was determined in light of minimizng the total capital investment requirement of the whole system and satisfying the temperature-rise constraint imposed on the cooling-system output. The structural-parameter method, in conjunction with the generalized reduced-gradient (GRG) method, was employed to optimally synthesize the cooling system. Under the assumptions made, the cooling tower and the cooling pond should not be connected in series.
W79-02081

WATER QUALITY CAN AFFECT MANAGEMENT PLANNING,
R. Ross.
Irrigation Age, Vol. 12, No. 1, p 60, 63, September, 1977. 1 fig.

Descriptors: Sodium, *Salt, *Saline water, Soils, *Irrigation, Irrigation effects, Irrigation practices, *Water quality, Water management(Applied).

Over a period of time, particularly on a fine-textured soil, a high concentration of sodium could change the character of the soil so that water could no longer penetrate it. A large amount of total salts could cause an 'artificial drought.' High sodium and/or too much total salts are among the primary reasons that irrigation water which may appear to be fine may, in face, be of poor quality. (Skogerboe-Colorado State)
W79-02096

CONTROLLING SEDIMENT IN SURFACE RUNOFF,
Agricultural Research Service, Kimberly ID. Snake River Conservation Research Center.
For primary bibliographic entry see Field 3F.
W79-02097

THE OCCURRENCE AND REMOVAL OF NITROGEN IN SUBSURFACE AGRICULTURAL DRAINAGE FROM THE SAN JOAQUIN VALLEY, CALIFORNIA,
California Dept. of Water Resources, Sacramento.

R. L. Brown.
Water Research Vol. 9, No. 5/6, p 529-546, May/June 1975. 11 fig, 7 tab, 39 ref.

Descriptors: *Drainage, *Drainage effects, *Water treatment, *California, *Nitrogen, Waste water treatment, Water pollution, Return flow, *San Joaquin Valley(Calif).

During the years 1967-1973 there have been extensive studies of subsurface agricultural drainage in the San Joaquin Valley of California. These studies, by cooperating state and federal agencies, were to determine the composition and quantity of drainage waters produced from irrigated agriculture, to evaluate possible methods of removing problem constituents (mainly nitrogen) from these waters, and to obtain an idea of the effectiveness of the treatment methods studied for reducing the waters' biostimulatory content with respect to potential receiving waters. (Skogerboe-Colo St)
W79-02107

ESTIMATES OF 7-DAY, 10-YEAR MINIMUM FLOWS AT SELECTED STREAM SITES IN PUERTO RICO,
Geological Survey, San Juan, PR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-02125

SOURCE ASSESSMENT: WATER POLLUTANTS FROM COAL STORAGE AREAS,
Monsanto Research Corp., Dayton, OH.
For primary bibliographic entry see Field 5B.
W79-02144

RESEARCH ON CONTROL TECHNOLOGY FOR ICE FOG FROM MOBILE SOURCES,
Environmental Protection Agency, College, AK. Alaska Water Lab.
H. J. Coutts, and R. K. Turner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 611, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/3-78-055, May 1978. 98 p, 27 fig, 3 tab, 14 ref, 4 append.

Descriptors: *Ice fog, *Automotive emissions, *Heat exchangers, *Air pollution effects, *Pollution control devices, *Cold regions, Mist, Pollution abatement, Pollutant identification, Condensation, Water vapor, Condensers.

Ice fog is a form of air pollution caused by the release of water vapor into air too cold to hold the water in vapor form. The vapor condenses into ice particles, which severely restrict visibility during extremely difficult driving conditions in subarctic areas, such as Alaska. The three major sources of ice fog are automotive and truck exhausts; open water surfaces, such as cooling ponds; and exhaust gases from heating and electrical powerplants. Research was conducted during the 1974-75 and 1975-76 winters, to determine and evaluate methods of reducing automotive generated ice fog. The major technique evaluated was removing the water vapor as a liquid condensate using cooler-condensers. These devices are heat exchangers in which the exhaust gas is cooled by cold ambient air or coolant from the automobile radiator. It was found that when using the cooler-condensers only, much of the condensed water formed a mist; therefore, use of coalescers was necessary to transform the mist into water. As on-the-road performance of a cooler-condenser equipped vehicle revealed that 81% of the overall water vapor was condensed at an ambient temperature of -16F. Estimations are that 50% of the ground level ice fog is generated by automotive sources, and that if ice fog control devices yielding an 80% reduction were used, vehicle ice fog emissions would be reduced approximately 40%. (Davison-IPA)
W79-02147

COMBINATION LIMESTONE-LIME NEUTRALIZATION OF FERROUS IRON ACID MINE DRAINAGE,
Industrial Environmental Research Lab., Cinncinnati, OH.
For primary bibliographic entry see Field 5D.
W79-02150

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULATIONS IN LAKES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W79-02152

EFFECT OF ANTIMYCIN ON STREAM INSECTS IN FIELD AND LABORATORY TRIALS,
Wisconsin Univ.-Madison. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W79-02156

INCREASING EFFICIENCY OF AQUATIC PLANT MANAGEMENT THROUGH PROCESSING,
Wisconsin Univ.-Madison. Water Resources Center.
For primary bibliographic entry see Field 4A.
W79-02158

PROCEEDINGS OF THE INTERSTATE SEAFOOD SEMINAR OCTOBER 4-7, 1977.
Virginia Polytechnic Inst. and State Univ., Hampton. Dept. of Food Science and Technology.
Virginia Polytechnic Institute and State University Sea Grant Publication, (1978). 287 p. W. R. Hess, Jr. (ed.).

Descriptors: *Food processing, *Shellfish, *Pollution abatement, *Toxicity, Water quality, Seafood, Aquaculture, Wastes, Water pollution control, *Coastal zone management, Estuarine management, Sanitary control, Ocean dumping.

An edited version is presented of the proceedings of the Interstate Seafood Seminar held in October 1977. Changes were made in the transcripts to turn oral delivery into a written publication. The larger purpose of the seminar was to improve the shellfish and crab meat sanitary control program, yet many of the presentations dealt with the biology, ecology, and nutritional value of specific shellfish. (NOAA)
W79-02163

SURFACE WATER VS. GROUND WATER,
National Water Well Associaton, Worthington, OH.
For primary bibliographic entry see Field 4B.
W79-02176

INNOVATIVE WATER SYSTEM SOLVES QUALITY PROBLEM,
Tacoma Dept. of Public Utilities, WA. Water Div.
J. A. Roller, and W. N. Moline.
Water and Sewage Works, Vol. 125, No. 11, p 70-73, November, 1978. 2 fig.

Descriptors: *Conjunctive use, *Water supply, *Turbidity, Water quality telemetry, Remote control.

Tacoma's principal water source, the Green River, has excessive turbidity in the late winter and early spring. At such times it is necessary to augment this supply with ground water from the North Fork well field, one of the most productive in the world. The six production wells have a total yield of 72 MGD with comparatively little drawdown. Six Byron Jackson submersible pumps, each with a capacity of 8,333 Gpm, were installed. From the North Fork wells, water is piped 7 miles to a 10 MG storage tank. When turbidity occurs in the Green River the river water is blended with well water from the storage tank to reduce turbidity to acceptable limits. The water-blending operation is controlled by two upstream turbidometers that continuously sample the river. Communications between the automated components of the pumping and blending systems are controlled by a solar-powered microwave relay station. When water from the storage tank is injected into the system on signal from the turbidity sensors, it will hydraulically block some or all of the river water, depending on how many blending valves are opened. (Purdin-NWWA)
W79-02183

UNDERGROUND INJECTION CONTROL PROGRAM STUDIED,
D. Webster.
Drill Bit, Vol. 27, No. 11, p 27, November, 1978.

Descriptors: *Injection, *Oil industry, *Water pollution, State governments, Administrative agencies, Environmental protection agency, Water flooding, Waste disposal wells.

At the annual meeting of the New Mexico Oil and Gas Association, Joe Raney, director of the state's Oil Conservation Division reported that ground water contamination from injection programs appears to be diminishing in Lea County but increasing in nearby Eddy County. However, there is not as much fresh water in the affected areas of Eddy County so the contamination potential is not as great. The state of New Mexico, in collaboration with the Federal Environmental Protection Agency, will soon be making an inventory of an estimated 16,000 oil field pits in the state. The EPA will also attempt to inventory all injection wells in the state. A recommendation will be made to the state legislature that the New Mexico Oil Conservation Commission be abolished and that the director of the state's Oil Conservation Division take over the responsibility of presiding over hearings. (Purdin-NWWA)
W79-02184

DREDGE SPOIL IN MISSISSIPPI SOUND,
University of Southern Mississippi, Hattiesburg.
For primary bibliographic entry see Field 5E.
W79-02188

PLANNING FOR OFFSHORE OIL DEVELOPMENT. GULF OF ALASKA OCS HANDBOOK,
Alaska Dept. of Community and Regional Affairs, Juneau. Div. of Community Planning.
L. S. Kramer, V. C. Clark, and G. J. Cannelos.
1978. 271 p.

Descriptors: *Alaska, *Resource development, Planning, *Oil industry, Exploration, Water quality control, Pollution abatement, Baseline studies, Environmental effects, Leases, Industrial production, *Outer Continental Shelf, Gulf of Alaska, Petroleum development.

The basic State policy framework within which the orderly search for offshore oil resources in the Gulf of Alaska and off Kodiak Island can proceed, is presented. This handbook provides information about the basic operations and planning requirements of the offshore industries. The purpose of the book is to clarify the nature of outer continental shelf (OCS) oil and gas activity in the waters off Alaska and to spell out what it will mean to all Alaskans, particularly to people in coastal communities directly involved. The book sets forth the State's policies on OCS development, encouraging cooperation and coordination of effort among local governments and state agencies so that related onshore activities will confer the most benefit and the least harm. (NOAA)
W79-02198

OXYGEN TRANSFER AT HYDRAULIC STRUCTURES,
Watson (J. D. and D. M.), London (England).
S. T. Avery, and P. Novak.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY11, Proceedings Paper 14190, p 1521-1540, November 1978. 8 fig, 4 tab, 35 ref, 2 append.

Descriptors: *Air entrainment, *Dissolved oxygen, *Oxidation, Laboratory tests, Model studies, Mathematical models, Hydraulic structures, Weirs, Jets, Spillways, Rivers, Water quality, Oxygen, Water pollution, Sewage, Turbulence, Hydraulic jump, Hydraulics, Hydraulic engineering.

The shortcomings of existing equations for the prediction of oxygen transfer at hydraulic structures were illustrated, particularly with reference to free overall weirs. The effect of all important hydraulic variables was reviewed together with water quality effects, in particular the effect of dissolved salts. Modelling according to the Froude law of similarity, the oxygen transfer expressed as a deficit ratio, was shown to vary as a simplified function of the scale. Equations were submitted describing the oxygen transfer in an hydraulic jump and at a free overfall weir. The lattr equation was shown to correlate successfully both model studies and measurements at a number of prototype structures; and, further, the application of the equation to a variety of situations such as spillway jets, multiple jet weirs and cascade of pools was described. An equation to estimate the optimum pool conditions for oxygen transfer was presented. (Sims-ISWS)
W79-02202

A SYSTEMATIC PROCEDURE FOR TAXING AGRICULTURAL POLLUTION SOURCES,
Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
W. R. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 656, Price codes: A06 in paper copy, A01 in microfiche. Report No. AER 75-76 WRW-1, October 1975. 107 p, 22 fig, 12 tab, 33 ref. NSF GK 42122.

Descriptors: *Water pollution sources, *Agriculture, *Agricultural runoff, *Pollution taxes(Charges), *Colorado River, Water pollution, Salts, Salinity, Leaching, Irrigation, Evapotranspiration, Water quality, Model studies, Mathematical models, Economics, Hydrology, Geology, Taxes, *Nonpoint water pollution sources, Irrigation return flow.

A methodology for taxing diffuse agricultural pollution sources was presented. The methodology is based upon deriving linkages between 3 economic and hydrologic modeling systems. The procedure involves modeling the hydro-quality system in the agricultural area in order to identify the specific processes causing water quality degradation. Then, these results are linked through a pollution coefficient to an economic externalities model describing the detriments incurred by downstream uses of water with poor quality characteristcs. An input-output model was developed from which input coefficients and business multipliers were calculated as a means of assessing the local economic impact of alternative taxing policies. The Grand Valley in Western Colorado was taken as the case study for this project since it is one of the more significant sources of salinity in the Colorado River Basin. The analysis evaluated the potential for taxing agricultural croplands in the valley as a means of controlling salinity-related damages in the lower Colorado River Basir.. Four groups of taxing strategies were investigated: (1) directly attributable detriments, (2) per acre equivalent salt loading, (3) salinity or pollution coefficients, and (4) values of gross revenue per acre. A discussion of how each tax could be applied was presented. (Sims-ISWS)
W79-02219

ENVIRONMENTAL IMPACT ASSESSMENT: AN AQUATIC BIOLOGIST'S POINT OF VIEW,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 6G.
W79-02222

WIND INDUCED DISPERSION AND ALGAL GROWTH IN SHALLOW LAKES,
Technische Hogeschool Twente, Enschede (Netherlands). Dept. of Chemical Engineering.
F. A. DiGiano, L. Lijklema, and G. Van Straten.
Ecological Modelling, Vol. 4, No. 2-3, p 237-252, 1978. 7 fig, 2 tab, 7 ref.

Descriptors: *Winds, *Dispersion, *Algae, *Lake Brielle(Neth), *Sedimentation, *Mathematical models, Model studies, Tracers, Lakes, Shallow water, Plant growth, Euphotic zone, Darkness, Netherlands, Eutrophication, Light, Limiting factors, Phosphates, Cycling nutrients.

A simple two-compartment model consisting of euphotic and dark zones, to show effects of dispersion and sedimentation on algal growth and phosphate cycling in shallow lakes, is demonstrated for Lake Brielle, Netherlands. Results are compared to those of a multi-layer finite-difference model which more accurately represents algal concentration gradients. Simulation suggests that algal growth occurs more rapidly in calm weather when wind-induced dispersion is negligible. Dispersion may influence the rate of particulate phosphate accumulation in sediment due to settling out of algal cells, and may also influence the soluble phosphate profile in the overlying water column. A tracer technique was used in Lake Brielle to measure dispersion caused by a moderate wind of 4 m/sec; results ranging 4-6 sq cm/sec compared well with predictions. The two models agreed well in predictions of average algal concentrations in euphotic and dark zones with dispersion rates of 0-6 sq cm/sec and sedimentation rate constants of 0.002-0.02 m/hr. Simulated wind-induced dispersion of only 1 sq cm/sec greatly suppressed algal growth in the euphotic zone; a higher sedimentation constant likewise restricted algal growth, even more pronounced with the inclusion of dispersion. It is uncertain whether dispersion values of 0 sq cm/sec actually occur during calm weather. (Lynch-Wisconsin)
W79-02226

BEST MANAGEMENT PRACTICES TO CONTROL NONPOINT-SOURCE POLLUTION FROM AGRICULTURE,
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
J. A. Krivak.
Journal of Soil and Water Conservation, Vol. 33, No. 4, p 161-166, 1978. 3 tab, 8 ref.

Descriptors: *Nonpoint pollution, Agriculture, *Water pollution control, *Best management practices, *Crop production, *Livestock, Federal Water Pollution Control Act Amendments of 1972, Clean Water Act of 1977, Irrigation, Feedlots, Pasture management, Pollutant identification, Pollutants, Salts, Nutrients, Soil erosion, Soil conservation, Pesticides, Organic matter, Pathogenic bacteria, Thermal pollution, Grazing, Agricultural runoff, Cultivation.

Provisions of the Federal Water Pollution Control Act Amendments of 1972 and the Clean Water Act of 1972 requiring and facilitating implementation of best management practices (BMPs) for control of nonpoint water pollution sources are briefly described, and their relationship to agriculture is discussed. The 1977 legislation provides management and resource assistance needed to accelerate rural water quality management programs. Pollutants resulting from nonirrigated crop production include sediment, nutrients, pesticides, and organic matter. Application of irrigating cropland increases the likelihood of runoff and resultant pollution from salts, sediment, and sediment-related pollutants. Confined animal production facilities generate pollution from nutrients, organics, sediment, salts, pesticides, and pathogens. Animals on pasture or range can generate excessive sediment, nutrients, organic matter, and pathogens through elimination of protective vegetation caused by overgrazing. BMPs represent a pollution preventive; this report describes several of them. BMPs for erosion and sediment control on croplan include tillage measures, management of surface and vegetative covers, and soil and water conservation. Techniques for preventing loss of nutrients and pesticides generally involve proper application, optimum dosage, timing, and disposal of unused chemicals and containers. Prevention of overgrazing involves evaluation of the land's forage capacity, animal grazing habits, soil characteristics and slope. (Lynch-Wisconsin)
W79-02233

MINNESOTA'S PEAT RESOURCES: THEIR CHARACTERISTICS AND USE IN SEWAGE TREATMENT, AGRICULTURE, AND ENERGY,
Minnesota Univ., St. Paul. Dept. of Soil Science.
R. S. Farnham, and D. H. Boelter.
In: A National Symposium on Freshwater Wetlands and Sewage Effluent Disposal, May 10-11, 1976, Ann Arbor, Michigan, University of Michigan, p 241-255, 12 ref.

Descriptors: *Peat, Hydrology, *Biological treatment, Crops, Waste water treatment, Nutrient removal, Fuels Soil amendments, Wetlands, Minnesota, *Peatlands, *Sewage treatment.

The most unique type of freshwater wetland in Minnesota is the 3 million ha of peatland. The hydrologic role of peatlands may not be as significant as once thought. Rather than soaking up snowmelt and early spring rains and gradually releasing runoff through the summer, peatlands often play a less significant role in the seasonal distribution of runoff with a large portion of the annual flow occurring prior to June 15. Drained and fertilized, these organic soils are productive for both field and forest crops, especially vegetable, seed, and forage crops, wild rice,, and other specialty crops. Peat is useful as a soil amendment or as a horticultural medium for plant growth. The relatively high caloric values of peat have led to its use as fuel in Europe and similar potentials exist in Minnesota. Renovation of waste waters is quite good using a combination of the filtering and absorbing action of peat and the harvest of plants growing on the filter beds for assimulation and remova of nutrients. (Stihler-Mass)
W79-02255

PROGRESS REPOT ON MOSQUITOE RESEARCH: CYPRESS DOMES,
Florida Univ., Gainesville. Dept. of Entomology and Nematology; and Florida Univ., Gainesville. Center for Wetlands.
H. Davis.
In: Third Annual Report on Cypress Wetlands, Florida University, Center for Wetlands, Gainesville, p 684-706, 1976. 12 fig, 2 tab.

Descriptors: *Swamps, *Water pollution control, *Mosquitoes, *Diptera, Wetlands, Florida, Waste water disposal, Aquatic insects, Diseases, Animal diseases, Water levels.

With the exception of a few species, most of the mosquitoes associated with the cypress swamps in northcentral Florida are not avid human blood feeders; however, two exceptions, Aedes infirmatus and Aedes atlanticus, are extremely annoying human pests. Both species are abundant in cypress swamps in which levels of standing water fluctuate seasonally. By adding sewage effluent, water levels in two swamps have been maintained at fairly constant levels throughout the summer. This has greatly reduced the numbers of these floodwater species that are breeding at the margins of these domes. Although the stable water level and extensive duckweed cover have caused a reduction in the available mosquito breeding area within the domes receiving effluent, six species are still abundant. Sentinel bird studies have shown that encephalitis is present in all of the five cypress domes sampled (two sewage and three control domes). Peak encephalitis activity occurred in late June and early July, coinciding with peak mosquito activity. No virus activity has been observed in areas outside the domes. In the early spring, the most annoying insect pest in these swamps is not a mosquito but the tabanid, Diachlorus ferrugatus, the yellow fly. (See also W79-02256) (Steiner-Mass)
W79-02281

PLANNING AND MODELING IN URBAN WATER MANAGEMENT,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 6B.
W79-02288

PRELIMINARY EVALUATION OF FINAL CUT LAKES,
Illinois State Water Survey, Urbana.
J. P. Gibb, and R. L. Evans.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 954, Price codes: A05 in paper copy, A01 in microfiche. Circular 130, 1978. 88 p, 41 fig, 39 tab, 15 ref, 1 append.

Descriptors: *Lakes, *Strip mines, *Strip mine lakes, *Water quality, Water resources, *Illinois, Pollutants, Water pollution, Chemicals, Sediments, Dissolved solids, Heavy metals, Hardness(Water), Dissolved oxygen, Hydrogen ion concentration, Water supply, Irrigation, Irrigation water, Surface waters, Stock water, Water sources, On-site investigations, Final cut lakes.

Twelve representative final cut impoundments were selected and studied to determine their volumes and estimated yield potentials. The volumes range from 97 to 3488 acre-feet and average 812 acre-feet. Estimated yield potentials at a 2-year recurrence interval range from 0.15 to 3.98 million gallons per day and average 0.86 million gallons per day. Projections of these estimates to lakes inventoried through June 30, 1971, were made and presented as county totals. The potential water supply from final cut impoundments for the 40 surface mining counties in Illinois ranges from 0 to 75.66 mgd. For 10 counties the estimated yield potential from final cut impoundments exceeds the estimated 2020 water demands. Based on published water quality requirements and data collected during this study, only 2 of the 12 lakes studied have water quality suitable as a source for public water supply. Three are suitable for irrigation, and all 12 are suitable for livestock watering. However, the quality of water from these impoundments is treatable and often comparable to the quality of alternative water sources. Each lake should be evaluated more closely in terms of yield, quality, and the economics of development as compared with other available water resources. (Sims-ISWS)
W79-02292

OIL SORBING MAT,
A. P. Lorentzen.
U.S. Patent No. 4,107,051, 4 fig, 3 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1252, August 15, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution treatment, Absorption, Water quality control, Oil sorbing mat, Fibrillated film.

An oil sorbing mat comprises sections of expanded fibrillated film assembled into a flexible resilient handleable and integral structure in which the sections are juxtaposed, with openings in the juxtaposed sections overlapped to establish a network of interstices into which oil can be received and stored. Fibrillated film means film that has been formed with a myriad number of generally parallel cuts closely spaced on an axis transverse to the direction of the cuts and staggered along longitudinal axis so as to leave an integral structure that may be expended, i.e. stretched transverse to the direction of the cuts, to form a lightweight net-like structure. Conventionally, after a film has been fibrillated it is twisted into a twine or rope. In this invention it is used in an expanded form in which the transverse width of the film is at least twice the transverse width of the film prior to fibrillation.
W79-02309

OIL SALVAGER,
S. Macaluso.
U.S. Patent No. 4,108,773, 9 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 4, p 1820-1821, August 22, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water quality control, *Water pollution treatment, Separation techniques, Skimming, Gravity separation, Oil recovery, Catamarans.

An oil salvage intensity separation chamber is mounted between the pontoons of a catamaran type vessel. A positionable scoop directs a contaminent, such as oil, floating on a body of water into an inlet opening provided in the lower portion of the chamber; while a deflector directs the oil up into the column of sea-water. A sea-water opening is provided in the lower portion of the chamber, with a set of valves and a pump to facilitate accumulating the column of sea-water in the chamber. An oil outlet and pump are provided in the upper portion of the chamber to draw off the separated oil which may be pumped through a suitable conduit to a collecting facility such as a barge. As the catamaran type vessel moves, the oil contaminated sea-water moves into the chamber and because of its lighter density the oil in globs or globlets floats up through the column of sea-water into a layer floating on top of the sea-water column. (Sinha-OEIS)
W79-02315

FRESH WATER SUPPLY AND WASTE WATER RETENTION SYSTEM,
CAF Industries, Phoenix, AZ. (Asignee).
R. E. Reed.
U.S. Patent No. 4,109,604, 7 p, 7 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 973, No. 5, p 2106, August 29, 1978.

Descriptors: *Patents, *Water storage, *Waste storage, Water pollution control, Pollution abatement, Recreation, Water quality control, Recreational vehicles.

A fresh water supply and waste water retention systems is incorporated within a floating carrier for transporting land based recreational vehicles on a body of water. The system includes one or more fresh water containers and one or more waste water containers, all of which are symmetrically placed about a selected lateral axis of the carrier. The system permits the transfer of water from the fresh water containers into the waste water containers without affecting the center of gravity of either the fresh water supply and waste water retention system or the center of gravity of the floating carrier/-recreational vehicle combination. (Sinha-OEIS)
W79-02317

COMPOSITIONS AND PROCESSES FOR THE DISPERSING OF OIL SPILLAGES,
Lanko Chemicals Group Ltd., MAnchester (England). (Assignee).
D. J. Tennant, P. Sheridan, and A. J. Steel.
U.S. Patent No. 4,110,213, 7 p, 6 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 5, p 2310, August 29, 1978.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution treatment, Water quality control, *Dispersion, Toxicity, Emulsions, Chemical reactions.

This invention provides compositions and processes for the dispersing of spilled oil, wherein the compositions are substantially non-toxic, to marine life or, at least less toxic than the prior art compositions, may generally be diluted with sea water without gelation (or increase in viscosity), are efficient in dispersing the spilled oil, are of a relatively concentrated nature, and are substantially free from fire hazard. The concentrate for use in the dispersion of oil spillages is substantially free from hydrocarbon solvent and comprises from 20 to 75% by weight of an emulsifying agent, which is a mono-ester of an aliphatic carboxylic acid and a polyoxy-alkylene glycol. The concentrate is physically and chemically stable to a wide range of temperatures, and may easily be diluted with water, especially sea-water, immediately prior to application. (Sinha-OEIS)
W79-02325

APPARATUS FOR COLLECTING DEBRIS FLOATING IN A STREAM,
A. L. Wagnon, and A. J. Janoulis.
U.S. Patent No. 4,110,216, 5 p, 5 fig, 20 ref; Official Gazette of the United States patent Office, Vol 973, no 5, p 2312, August 29, 1978.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, Streams, Running water, Storm runoff, Equipment, Debris collection.

An apparatus is provided for collecting debris floating in a stream and the apparatus in one form may comprise a collector placed astride the stream with a first part arranged to engage and intercept floating debris. Another part is pivotally mounted downstream from the first part and above the surface of the stream. Lift means secured to the collector adjacent the first part controls the elevation of the first part in accordance with variations in the level of water in the stream. (Sinha - OEIS)
W79-02328

FILRATION SYSTEM,
Canplan Filtration Ltd., Halifax (Nova Scotia).
For primary bibliographic entry see Field 5D.
W79-02332

GRAVITATIONAL SEPARATOR FOR MIXTURES OF IMMISCIBLE LIQUIDS OF DIFFERENT DENSITIES,
National Marine Service, Inc., St. Louis, MO. (Assignee).
For primary bibliographic entry see Field 5D.
W79-02336

DEVICE FOR THE REMOVAL OF A LIQUID LAYER ON WATER,
Societe Generale de Constructions Electriques et Mecaniques Alsthom, Paris (France). (Assignee).
J. Pichon.
U.S. Patent No. 4,111,809, 9 p, 5 fig, 22 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 331, September 5, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water quality control, Equipment, Separation techniques, Centrifugation, *Flotation, Oil collection, Suction.

The floating apparatus comprises a cyclone carrying a normally submerged dam forming with the body of the cyclone a water compartment containing the cyclone inlet orifice. The sill of the dam is situated below but close to the free surface of the body of water from which the pollutant is to be removed and such sill is formed to create a continuous flow of water and pollutant into the compartment to form a level of the mixture lower than that of the free surface of the body of water. The dam has a height enabling the level of water in the compartment to be maintained constantly higher than the inlet orifice of the cyclone. Suction means are connected to the lower outlet for filling the cyclone up to its ceiling with the liquid mixture from the compartment. A cyclonic rotation is produced capable of separating the water and pollutant by centrifugation and concentrating the pollutant in an axial central zone of the cyclone, and for removing the water freed from the pollutant through the lower outlet of the cyclone. Another suction means removes the separated concentrated pollutant through the ceiling of the cyclone. Means are provided to adjust the inlet flow of the cyclone so as to maintain the level of the mixture in the compartment at a constant height. (Sinha-OEIS)
W79-02337

APPARATUS FOR COLLECTING EFFLUENT OIL,
Mitsubishi Jukogyo Kabushiki Kaisha, Tokyo (Japan). (Assignee).
S. Fukuda, Y. Seiki, M. Iizuka, H. Kasai, and M. Enami.
U.S. Patent No. 4,111,811, 12 p, 11 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, No 1, p 331-332, September 5, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution treatment, Water quality control, Weirs, Equipment, Oil collection, Suction.

An improved apparatus for collecting effluent oil floating on a water surface utilizes a pair of side plates placed in a forwardly opened arrangement, a weir which is inclined in a rear-downward direction with its opposite side edges contacted to the inner wall surfaces of the side plates under the water surface, and a slant plate which as its rear end positioned above the rear end of the weir and has its opposite side edges secured to the inner wall surfaces of the side plates. An oil leakage preventing plate is positioned midway between the rear end of the weir and the read end of the slat plate and is secured to the inner wall surfaces of the side plates to form a water discharge port and an oily water intake port between the oil leakage preventing plate and the rear end of the slant plate. The oily water intake pipe is connected with the oil water intake port and a float is mounted to the side plates. In addition, wave buffering chambers are positioned above the slant plate and the intake port to help absorb the kinetic energy of wave action forced against the intake port. (Sinha-OEIS)
W79-02339

PERIMETER DIKE RAISING WITH DEWATERED FINE-GRAINED DREDGED MATERIAL AT UPPER POLECAT BAY DISPOSAL AREA, MOBILE, ALABAMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5E.
W79-02345

ABILITY OF SALT MARSHES TO REMOVE NUTRIENTS AND HEAVY METALS FROM DREDGED MATERIAL DISPOSA AREA EFFLUENTS,
For primary bibliographic entry see Field 5E.
W79-02347

POSSIBILITY OF RENDERING BLEACHERY EFFLUENTS HARMLESS BY TECHNOLOGICAL CHANGES (UEBER DIE MOEGLICHKEIT BLEICHEREIABWAESSER DURCH TECHNOLOGISCHE AENDERUNGEN UNSCHAEDLICH ZU MACHEN),
Vyskumny Ustav Papieru a Celulozy Bratislava (Czechoslovakia). Forschungsinstitut fuer Zellstoff Und Papier.
J. Schmied, and J. Gajdos.
Wochenblatt fuer Papierfabrikation, Vol. 106, No. 10, p 375-378, May 31, 1978. 5 fig, 9 ref.

Descriptors: *Bleaching wastes, *Water pollution control, *Sulfite pulp mills, *Water reuse, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Ammonia, Sodium compounds, Magnesium compounds, Lignins, Chlorine, Pulp wastes, Pulp washing, Closed systems, Sodium hydroxide, Magnesium chloride, Chlorine dioxide, Water conservation.

The possibility of closing the water circuit of a sulfite pulp mill, specifically by circulating the bleachery effluent back to unbleached pulp washing and then to chemical recovery, is particularly applicable to magnesium bisulfite pulping. Points relating to the success of such operation include pulping to low kappa number, substitution of chlorine dioxide for liquid chlorine in chlorination, use of ammonia instead of NaOH in the extraction stage, effect of magnesium chloride on the reaction of lignin with chlorine and chlorine dioxide, and the optimal use of chlorine dixoide in bleaching to various degrees of whiteness. (Ward-IPC)
W79-02360

POSSIBILITIES AND MEASURES IN THE PULP INDUSTRY IN THE INTEREST OF ENVIRONMENTAL PROTECTION (MOEGLICHKEITEN UND MASSNAHMEN DER ZELLSTOFFINDUSTRIE IM INTERESSE DES UMWELTSCHUTZES),
Umweltschutz, Vol. 14, No. 12, p 302, 304-310, 1977.

Descriptors: *Pulp and paper industry, *Water pollution control, *Austria, *Air pollution control, Foreign countries, Europe, Pulp wastes, Bleaching wastes, Water pollution sources, Sulfite pulp mills, Kraft mills.

This is a general review of the pollution control program of the Austrian pulp industry. Research and development in the area of reducing and treating sulfite and sulfate (kraft) pulping effluents and pulp bleaching effluents and controlling sulfite and sulfate mill air pollution are reviewed. Recent pollution control measures taken at specific Austrian mills are outlined. (Speckhard-IPC)
W79-02369

PULP INDUSTRY AND WATER POLLUTION CONTROL (ZELLSTOFFINDUSTRIE UND GEWAESSERSCHUTZ),
H. Fleckseder.
Umweltschurz, Vol. 14, No. 12, p 288-293, 1977. 4 fig, 1 tab.

Descriptors: *Water pollution control, *Pulp and paper industry, *Sulfite pulp mills, Wastes, Industrial wastes, Water pollution sources, Pulp wastes, Chemical oxygen demand, Biochemical oxygen demand, Carbon, Water pollution, Bleaching wastes, Sulfite liquors, Neutralization, Waste water treatment, Waste treatment, Water pollution treatment, Filtration, Flotation, Sedimentation, Condensates.

COD, BOD, and total organic carbon (TOC) are discussed as indices for describing the level of pollution of pulp mill waste waters, and process measures for reducing the pollution load of such waste waters are reviewed. The pollution load of a magnesium-base sulfite pulp mill is compared to that of a calcium-base sulfite pulp mill. It is shown that BOD can be reduced to about 20 kg/ton of pulp and COD to about 50 kg/ton of pulp at 99% liquor recovery in a system where 70% of the organic load from bleaching is combined in liquor recovery and where 50% of the organic load remaining after spent liquor neutralization is removed from the condensate via stripping. Possibilities for effluent treatment (filtering, flotation, sedimentation) to reduce this load further are also reviewed. (Speckhard-IPC)
W79-02370

INTERIM RECOMMENDATION FOR THE USE OF BUFFER STRIPS FOR THE PROTECTION OF SMALL STREAMS IN THE MARITIMES,
New Brunswick Dept. of Fisheries and Environment, Fredericton. Maritime Forest Research Center.
H. van Groenewoud.
Canadian Forestry Service, Information Report M-X-74, 21 p, 1977. 1 fig, 1 illus, 30 ref.

Descriptors: *Lumbering, *Forest watersheds, *Water pollution control, Clear-cutting, Water pollution sources, Cutting management, Land clearing, Runoff, Watershed management, Pulp and paper industry, Wood wastes, Water pollution, Surface waters, Streams, Heating, Silting, Springs, Bogs, Buffer strips, Logging equipment, Soil conservation.

The detrimental effects of clearcutting stream banks and other logging practices are discussed, and preliminary recommendations are made for the use of buffer strips to minimize these effects. A 65-m (200-ft) wide buffer strip is not always necessary for protection against heating of the stream water. On relatively flat terrain, a buffer strip as narrow as 15 m (50 ft) will provide adequate protection against both heating and sediments. On moderately sloping terrain a 65-m (200-ft) strip is adequate if reasonable care is taken in the laying out of skid trails and haul loads. The buffer strip should extend the full length of the stream and also protect the major springs. Logging equipment should not be allowed to cross the buffer strip except where adequate protection measures have been taken. In boggy areas bordering streams, cutting by chain saw and hauling by cable can be allowed up to 15 m from the stream. (Witt-IPC)
W79-02384

RANGE CATTLE IMPACTS ON STREAM WATER QUALITY IN THE COLORADO FRONT RANGE,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
S. R. Johnson, H. L. Gary, and S. L. Ponce.
Department of Agriculture, Forest Service Research Note RM-359, 8 p, September, 1978. 2 fig, 1 illus, 14 ref, 2 tab.

Descriptors: *Water quality, *Pastures, *Cattle, *Colorado, *Surface waters, Grazing, Ranges, Bacteria, Water pollution, Water pollution sources, Livestock, Trout Creek(Colorado).

Studies on two adjacent pastures along Trout Creek in central Colorado indicated only minor effects of cattle grazing on water quality, but bacterial contamination of the water increased significantly. When the cattle was removed, bacterial counts dropped to levels similar to those in the ungrazed pasture. (Witt-IPC)
W79-02386

PRECIPITATION AND RUNOFF WATER QUALITY FROM AN URBAN PARKING LOT AND IMPLICATIONS FOR TREE GROWTH,
Missouri Univ.-Columbia.
For primary bibliographic entry see Field 5B.
W79-02387

WATER-QUALITY MONITORING IN THE AMERICAN URBANIZING SOUTHWEST,
Metcalf and Eddy, Boston, MA.
For primary bibliographic entry see Field 5B.
W79-02397

OPTIMIZATION AND TESTING OF HIGHWAY MATERIALS TO MITIGATE ICE ADHESION,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 8G.
W79-02408

ACID MINE DRAINAGE AND SUBSIDENCE: EFFECTS OF INCREASED COAL UTILIZATION,
Industrial Environmental Research Lab., Cincinnati, OH.
R. D. Hill, and E. R. Bates.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 092, Price codes: A03 in paper copy, A01 in microfiche. Final Report No EPA-600/2-78-068, April 1978. 38 p, 2 fig, 11 tab, 18 ref.

Descriptors: *Acid mine water, *Mine wastes, *Coal mines, *Settlement, *Waste treatment, Mine drainage, Subsidence, Soil management, Soil engineering, Soil stability, Slope stability, Groundwater resources, Aquifers, Legislation, Surface mining control and reclamation act.

In 1969, it was estimated that over 10,000 miles of streams had been degraded by acid mine drainage (AMD), a unique pollutant, because acid generation and discharges continue after mining has ceased. Underground mines contribute over 70% of the AMD, of which a significant amount is contributed by inactive mines. Subsidence, the instability within rock created by the void resulting from mining operations, disturbs natural drainage areas, sewage lines, roads, and bridges, and can intercept groundwater supplies, diverting them to deep mines. Projected increases of AMD and subsidence beyond the 1975 levels for the years 1985 and 2000, based on current mining trends and the National Energy Plan (NEP), are presented. No increases are projected for AMD from surface mines or waste, because enforcement under present laws is expected to control this problem. AMD from underground mines is expected to increase

16% in 1985 and 10% by 2000; subsidence is projected to increase 34% in 1985 and 115% by 2000. The smaller increase in AMD in 2000 over 1985 reflects the impact of Public Law 96-87, the abandoned mine program. The projected subsidence figure for the year 2000 may be smaller if subsidence control measures are adopted. Available AMD control and treatment technology are summarized, and subsidence cause and effect control are discussed. It is recommended that AMD point discharges be treated during active mining, and that Federal, State and local governments cooperate to address subsidence problems. (Davison-IPA)
W79-02409

SURVEY OF ENVIRONMENTAL REGULATIONS APPLYING TO GEOTHERMAL EXPLORATION, DEVELOPMENT, AND USE,
WAPORA, Inc., Washington, DC.
G. V. Beeland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 023, Price codes: A12 in paper copy, A01 in microfiche. Final Report No EPA-600/7-78-014, February 1978. 254 p, 3 fig, 14 tab, 19 ref, 13 append. 68-03-2371.

Descriptors: *Legislation, *Environmental control, *Geothermal development, Air pollution, Water pollution, Solid wastes, Waste disposal, Waste identification, Landfills, Water quality, Toxicity, Subsidence, Sedimentation, Permits.

A survey of the local, State, Federal and federally approved ordinances, statutes, regulations, and standards designed to minimize adverse environmental effects of pollution sources in the production and use of geothermal resources is presented. The areas of greatest concern include: air and water pollution control, noise reduction, land disposal of wastes, subsidence control, radiation control, and erosion and sedimentation control. Analyses of the regulations are made with regard to resource definition, pollutants currently not controlled, duplicity and overlaps in permit and impact assessment requirements, the lack of uniformity between states, and the probable future approaches to the regulatory problems. (Davison-IPA)
W79-02410

HAZARDOUS MATERIAL SPILLS: A DOCUMENTATION AND ANALYSIS OF HISTORICAL DATA,
Factory Mutual Research Corp., Norwood, MA.
J. L. Buckley, and S. A. Weiner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 090, Price codes: A11 in paper copy, A01 in microfiche. Final Report No EPA-600/2-78-066, April 1978. 244 p, 48 fig, 8 tab, 9 ref, 9 append. 68-03-0317.

Descriptors: *Accidents, *Hazards, *Spills, *Documentation, *Data collections, Negligence, Equipment failure, Statistics, Industrial operations, Safety, Water pollution, Analysis.

The goal of this study was to further hazardous material spill prevention by gathering and analyzing spill data to provide guidance for future research. Of the 1500 incidents scanned, 10% were documented as hazardous, and a computer program was prepared to provide the desired sorts. Frequency distributions of the data were obtained as a function of the operational areas, primary cause, and other significant information for each spill incident. A hazard potential scheme was developed to rank spills according to their potential severity, which listed quantity and toxicity of the material, so that comparisons of the spills could be made. The frequency distribution by Hazard Potential Category for primary causes and operational areas, such as in transit, loading-unloading areas, in plant storage and in plant processing, were used to distinguish and evaluate problem areas. (Davison-IPA)
W79-02411

EFFECT OF DISSOLVED OXYGEN AND REDOX POTENTIAL AND NITRATE REMOVAL IN FLOODED SWAMP AND MARSH SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W79-02426

HYPERSALINE LAGOONAL DEPOSITS AND PROCESSES,
University of Southern California, Los Angeles. Dept. of Geological Science.
For primary bibliographic entry see Field 2L.
W79-02430

ANALYSIS OF THE ENVIRONMENTAL CONTROL TECHNOLOGY FOR OIL SHALE DEVELOPMENT,
Utah Univ., Salt Lake City. Coll. of Engineering.
N. deNevers, D. Eckhoff, S. Swanson, B. Glenne, and F. Wagner.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-404301, Price codes: A13 in paper copy, A01 in microfiche. Report No COO-4043-1, February 1978. 300 p, 50 fig, 22 tab, 111 ref, 8 append. EY-76-S-02-4043.

Descriptors: *Oil shales, *Water pollution control, *Air pollution control, *Waste disposal, Clean Air Act, Water Quality Act, Waste treatment, Solid wastes, Effluents, Emissions, Vegetation establishment, Erosion control, Strip mines, Strip mine wastes, In-situ retorting, Surface retorting, Land tenure.

The proposed environmental control technology for the various oil shale projects now under development are comprehensively examined. Emphasis is on the application of the technologies to the three Federal prototype lease projects: C-b, Rio Blanco, and White River, as well as two others, where including them seemed appropriate. Control of air pollution, water pollution, and disposal, stabilization and vegetation of the processed shale were investigated. Basic air pollution control will be to minimize the emissions of recognized air contaminants through the utilization of technologies applied by related industries. Prevention of any surface or subsurface flow of contaminated water leaving the shale processing site will be the basis for water pollution control strategy. Two of the three Federal lease projects have converted from strip mining and surface retorting to in-situ retorting. A comparison of in-situ and surface processing from an environmental viewpoint is presented. (Davison-IPA)
W79-02432

PROCEEDINGS OF A WORKSHOP ON THE EVALUATION OF MODELS USED FOR THE ENVIRONMENTAL ASSESSMENT OF RADIONUCLIDE RELEASES.
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W79-02434

ADVANCES IN STORM AND COMBINED SEWER POLLUTION CONTROL ABATEMENT TECHNOLOGY,
Environmental Protection Agency, Washington, DC. Office of Research and Development.
For primary bibliographic entry see Field 5D.
W79-02437

MANPOWER UTILIZATION AND FUTURE NEEDS OF MANUFACTURING INDUSTRIES IN WATER POLLUTION CONTROL,
Utah State Univ., Logan. Coll. of Engineering.
E. J. Middlebrooks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 689, Price codes: A06 in paper copy, A01 in microfiche. June 1974: 105 p, 16 fig, 30 tab, 11 ref, 1 append. 5-SF-WP-1.

Descriptors: *Manpower, *Manpower projections, *Waste water treatment, *Personnel management, *Projected planning, *Water quality standards, Occupations, Labor supply, Forecasting, Long term planning, Industrial wastes, Water pollution treatment.

Future manpower requirements in industrial waste water treatment are discussed. Data derived from the 1968 Census of Water Use in Manufacturing, and Environmental Protection Agency (EPA) poll, and an Environmental Science Services Corporation (ESSC) report were used to develop the total numbers of personnel in various industry categories working on water pollution control, and to develop staffing models for the occupational categories. Projections made with ESSC models appear to be more realistic than those made with EPA models, because too little data on large plants was available. Estimated manpower involved in industrial water pollution control during 1974 was from 540,000 to 900,000, with a projected increase of 300 to 400% for the following five years. It is anticipated that the rate of increase in work force would be directly related to the rate at which new treatment standards will be implemented and enforced. The increased work force will result in the need for intensive educational and training programs to upgrade existing plant personnel, and to facilitate advanced treatment concepts and automation. Although plant automation may reduce the number of personnel directly employed in waste water treatment, skilled operators and technicians will be needed to calibrate and control the facilities. Much of the material presented is tabulated with regard to the type of industry, the quality and quantity of its effluent, the number of people in waste water treatment, and the jobs associated with waste water treatment. (Davison-IPA)
W79-02438

STORM AND COMBINED SEWER POLLUTION CONTROL PROGRAM REPORTS. RESEARCH, DEVELOPMENT, AND DEMONSTRATION GRANT, CONTRACT, AND IN-HOUSE PROJECT REPORTS.
National Environmental Research Center, Edison, NJ. Edison Water Quality Research Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 155, Price codes: A02 in paper copy, A01 in microfiche. January 1972. 10 p.

Descriptors: *Bibliographies, *Research and development, *Water pollution control, *Storm drains, *Sewers, Standards, Regulation, Management, Grants.

A listing of EPA-sponsored research and developing grant, contract, and inhouse project reports provided in report number order. The title, author, and source of the reports are included. These reports, collectively, are called the Water Pollution Control Research series and describe the results and progress in the control and abatement of pollution in our nation's waters. (Gibson-IPA)
W79-02442

THE CRUSTACEAN ZOOPLANKTON OF GRASMERE BEFORE AND AFTER A CHANGE IN SEWAGE EFFLUENT TREATMENT,
Freshwater Biological Association, Ambleside, (England).
For primary bibliographic entry see Field 5C.
W79-02458

FISH FARMS ARE HAVING TO WATCH THEIR WASTE.
Vandkvalitetsinstitutet, Hoersholm (Denmark).
Fish Farming International, Vol. 5, No. 3, p 19, 1978. 1 tab.

Descriptors: *Fish farming, *Nutrients, *Waste water treatment, *Settling basins, *Aquiculture, Farm ponds, Fish harvest, Fish management, Water pollution sources, Animal wastes(Wildlife), Suspended solids, Fish hatchery, Commercial fish.

The rapid development of fish farming has focused attention on the ecological problems generated by the discharge wastes from these farms. Pollutants consist mainly of unconsumed fish feed and fish feed wastes. This article reports on a Danish attempt at using settling tanks to reduce the discharged suspended solids. The authors report that by utilizing the tanks a decrease of up to 80% in suspended solids was obtained. (EIS-Deal)
W79-02474

THE EFFECTS OF SOME BASIC STATISTICAL AND BIOLOGICAL PRINCIPLES ON WATER POLLUTION CONTROL,
British Columbia Univ., Vancouver. Faculty of Commerce and Business Administration.
H. D. Drechsler, and P. N. Nemetz.
Water Resources Bulletin, Vol. 14, No. 5, p 1094-1104, October 1978. 7 fig, 1 tab, 11 ref.

Descriptors: *Water quality standards, *Water quality control, *Water pollution control, *Water policy, Regulation, Monitoring, Sampling, Pollutant identification, Data collections, Statistical methods, Reliability, Analytical techniques, Toxicity, Bioassay, Methodology.

The hypothesis of this paper is that the frequently used regulatory practice which employs point estimates in water pollution control objectives, in combination with monitoring at infrequent intervals, is an inadequate scientific procedure for the measurement and control of pollution. The first part of this paper outlines the relevant sampling theory which applies to the measurement of effluent from industrial plants and describes the possible errors in sampling practice which currently affect the interpretation and enforcement of environmental standards. In the second part of the paper, the authors describe briefly the environmental significance of biological damage functions. In the final part of the paper, the authors recommend that existing pollution control regulations be restructured to be more efficient and effective in the protection of both corporate and social interests. By adopting two different approaches to regulation depending upon the nature of the appropriate damage functions and critical fish species, it is possible to reduce significantly the waste of resources.
W79-02498

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

A SIMULATION MODEL FOR RESOURCE POLICY EVALUATION,
W. E. Tyner, and R. J. Kalter.
Cornell University, Ithaca, NY, Department of Agricultural Economics, Paper 76-35, 1976. 47 p, 7 fig, 3 tab, append. NSF SIA74-21846.

Descriptors: GEN2 model, *Simulation analysis, *Computer models, *Natural resources, *Policy, *Evaluation, *Methodology, *Model studies, Monte Carlo method, Economics, Resources development, Federal government, Leases, Private sector, Public sector, Computer programs, Governments, Costs, Subsidies, Investment.

The Generalized resource Policy Evaluation Model, GEN2, incorporates discounted cash flow techniques to simulate private sector response to public resources policies. Such response tends to be similar regrdless of resource. The model is useful for evaluating government policy questions relating to disposition of publicly owned natural resources. An appendix contains operating instructions both for the model and for the program input sequence. The model, written in FORTRAN, can analyze a wide range of leasing policy systems, including bonus bidding, royalty, and Indian production sharing, as well as other policy options such as tax policies, price subsidies, purchase guarantees, price supports, investment subsidies, and other options designed to increase certainty for private investors. Ouputs include statistics on production time horizon, installed capacity, and present value of royalty payments, depletion, taxes and taxable income, profit share or production share payments, production reserves, investment and operating costs, gross revenue, and after tax net present value. Additional outputs are provided for such specialized leasing or other policy options as the royalty bidding system. Monte Carlo simulation with uncertain variables makes it possible not only to determine the change in expected value of outputs when a policy variable is changed, but also the change in variance of outputs. (Lynch-Wisconsin)
W79-02025

GROWTH AND OPTIMAL GROWTH WITH RENEWABLE AND NON RENEWABLE NATURAL RESOURCES,
London Univ. (England).
P. C. Thanh.
Queen's University of Kingston, Ontario, Canada, Institute for Economic Research; Discussion Paper No. 264, (1977), 52 p, 6 fig, 27 ref.

Descriptors: *Optimization, *Economic growth, *Mathematical models, *Natural resources, Model studies, Economics, Competition, Reviews, Conservation, Profit, Resource allocation, Marginal utility, Consumption.

Natural resources are examined in the context of economic growth, and a review of literature is given. The free competitive market cannot be relied upon to bring about best natural resources use. Efficient growth is only compatible with greatest protection of renewable resources. For growth under competition a 'golden rule for resource utilization' is described: In a competitive economy dependent on natural resources, steady growth is possible only if the ratio of resource utilization to the resource stock is constant; the saving ratio is proportional to the profit share (ratio of output growth rate and sum of output growth rate and resource utlilization rate). The most efficient growth path for exhaustible resources is one in which the saving ratio is nearest to the profilt share, and the renewable resources one in which the natural growth rate of resources is at its maximum. The section of the study on normative aspects yields two theorems: (1) for each value of marginal utility elasticity there is a rate of pure time preference whereby the consumption program of an optimizing economy will be the same for both exhaustible and renewable resources; and (2) the asymptotic growth rate of per capita consumption will be negative in an exhaustible resource economy and positive in one with renewable resources if there is a strictly positive pure-time preference rate, without technical progress or population growth, but with an optimal consumption program. (Lynch-Wisconsin)
W79-02032

COORDINATING PUBLIC UTILITY EXPANSION, INDUSTRIAL SITING AND POLLUTION CONTROL: A WORKING DYNAMIC PROGRAMMING ALGORITHM,
California Univ., Riverside. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-02039

THE LIMITED APPLICABILITY OF MARSHALLIAN ECONOMICS TO THE PROBLEM OF POLLUTION ABATEMENT: A SUGGESTED ALTERNATIVE,
Indiana Univ. at South Bend. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-02041

MEASUREMENT OF ECONOMIC UNCERTAINTY IN PUBLIC WATER RESOURCE DEVELOPMENT: AN EXTENSION,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W79-02050

OPTIMAL AND COMPETITIVE USE OF REPLENISHABLE NATURAL RESOURCES BY OPEN ECONOMIES,
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 6C.
W79-02058

MEASURING NATURAL RESOURCES SCARCITY: THEORY AND PRACTICE,
Resources for the Future, Inc., Washington, DC.
Quality of the Environment Program.
For primary bibliographic entry see Field 6B.
W79-02059

COSTLY INNOVATION AND NATURAL RESOURCES,
For primary bibliographic entry see Field 6B.
W79-02062

MODEL AIDS PLANNERS IN PREDICTING RISING GROUND-WATER LEVELS IN SAN BERNADINO, CALIFORNIA,
Geological Survey, Laguna Niguel, CA.
For primary bibliographic entry see Field 4B.
W79-02173

PLANNING AND MODELING IN URBAN WATER MANAGEMENT,
Hydrocomp, Inc., Palo Alto, CA.
For primary bibliographic entry see Field 6B.
W79-02288

ECONOMIC IMPACT OF ALTERNATIVE STORMWATER DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D.
W79-02289

DEVELOPMENT OF A STREAM-AQUIFER MODEL SUITED FOR MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W79-02450

STOCHASTIC MODELING FOR PREDICTING FREQUENCY DISTRIBUTION OF STAGES IN THERMAL LAKES AT FUTURE PLANNING HORIZONS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W79-02495

6B. Evaluation Process

A SIMULATION MODEL FOR RESOURCE POLICY EVALUATION,
For primary bibliographic entry see Field 6A.
W79-02025

QUANTIFICATION, DECISION-MAKING AND ENVIRONMENTAL IMPACT ASSESSMENT IN THE UNITED KINGDOM.
Aberdeen Univ. (Scotland). Dept. of Geography.
For primary bibliographic entry see Field 6G.
W79-02028

COEFFICIENTS OF POLLUTION: INTERINDUSTRY LINKAGE AND POLLUTION IN BELGIUM,
State Univ. of New York at Binghamton. School of Management.
For primary bibliographic entry see Field 5G.
W79-02031

GROWTH AND OPTIMAL GROWTH WITH RENEWABLE AND NON RENEWABLE NATURAL RESOURCES,
London Univ. (England).

For primary bibliographic entry see Field 6A.
W79-02032

AN ANALYSIS OF NETWORK COSTS: A STUDY OF SYDNEY'S WATER SUPPLY FROM 1890 TO 2001, PART I: RESEARCH METHODS,
Australian National Univ., Canberra. Research School of Social Sciences.
B. M. Firestone.
Australian National University, Urban Research Unit Seminar Paper, EWP 470/77, 1977. 56 p, 16 tab, 30 ref, 3 append.

Descriptors: *Sydney(Australia), *Water supply, *Networks, *Costs, *Economics, *Methodology, *Water consumption(Except consumptive use), Forecasting, *Australia, Municipal water, Reservoirs, Urbanization, Water demand, History, Water rates, Analytical techniques, Population, Financing, Replacement costs, Planning, Decision making, Investment, Economics of scale.

Part I of a study of network costs of the Sydney, Australia water supply system describes the methodology used; part II will explain network costs and relate them to cost projection sensitivity. Aggregate capital and operating costs are given for 1890-1976, and are projected for 1976-2001. This paper postulates hypotheses, describes data and analytical problems in testing data, and presents cost projections. The project is a component of a broader study of the water supply and sewerage experience of several urban areas, aimed at evaluating: (1) returns to scale of this type of urban infrastructure; (2) effects of urban growth patterns on network costs; (3) impacts of residential density on network costs; (4) the 'gressivity' of charging systems; (5) rising finance and replacement costs; (6) the impact of standards and design practice on investment levels; (7) relationships of costs to prices; and (8) the relationship between demand price and supply price for investment decisions. Sydney's population grew from about 354,000 in 1890 to 3.1 million in 1976. Per capita demand has risen from 125 liters/day in the early 1890s to over 470 liters/day in the 1970s. Accounting unit costs are expected to increase from $.103/1000 liters in 1971 to $.205 in 2001, a 99% increase. Unit replacement costs will increase from $.381/1000 liters in 1971 to an estimated $.673 in 2001 (77%). (Lynch-Wisconsin)
W79-02033

NATURAL RESOURCES AND REGIONAL DISPARITIES: A SKEPTICAL VIEW,
L. W. Copithorne.
Economic Council of Canada, Ottawa Discussion Paper 106, 1978. 51 p, 3 fig, 12 tab.

Descriptors: *Natural resources, *Economic development, *Regional development, *Canada, *British Columbia(Canada), *Staple theory, *Forests, *Pulp and paper industry, Oil, Energy, Population, Economic growth, Regional analysis, Economics, Income distribution, Resources development, Tariff, Model studies, Linear programming, Computer models.

A study of the role of natural resources in Canada's regional economic disparities contradicts the 'staple theory' of traditional Canadian economics and supports conclusions of the Economic Council of Canada's 1977 study. The latter attributed economic disparities to differences in productivity and technical, aggregate demand, and urban structure, rather than to natural resources, exports of staples, transportation, and tariffs. The present study uses aggregate measures and multi-regional linear programming models of forest products, gold and base metals, asbestos, and energy. Results strongly suggest that under the current forest resource pricing method in British Columbia, natural resource rents have inflated wage payments in manufacturing, resulting in: (1) the manufacturing sector priced almost out of existence, (2) high local cost of living, (3) inemployment, and (4) stimulation of inmigration despite unemployment. Other conclusions: (1) interregional migration is ineffectual in changing long-run wage rates: (2) in a competitive trading region (unlike British Columbia), the general wage level is determined in nonprimary trading sectors, independently of the natural resource endowment; (3) some surpluses in resource industries are monopoly profits, not Ricardian economic rents; and (4) government equalization transfer of economic rents have been smaller than transfers under the oil export tax/import scheme or Churchill Falls power agreement. (Lynch-Wisconsin)
W79-02034

THE CHOICE OF EFFICIENT POLLUTION POLICIES: TECHNOLOGY AND ECONOMICS IN THE CONTROL OF SULPHUR DIOXIDE,
London School of Economics and Political Science (England).
For primary bibliographic entry see Field 5G.
W79-02038

ON THE OPTIMAL POLICY FOR EXPLOITING RENEWABLE RESOURCE STOCKS,
Victoria Univ. of Manchester (England).
J. McInerney.
Journal of Agricultural Economics, Vol 29, No 2, p 183-188, May 1978. 2 fig, 2 ref.

Descriptors: *Mathematical models, *Natural resources, Economics, *Renewable resources, *Optimization, *Policy, Model studies, Resource allocations, Cost-benefit analysis, Marginal costs, Marginal benefits, Discount rates, Demand, Planning, Public benefits.

The author revises his analysis of 'destructible, renewable stock resources' in a previous paper on natural resource economics (1976), which contained certain errors. Two aspects require revision: (1) discussion of optimal allocation of the resource stock (marginal net benefits equal in each period) and the accompanying figure (erroneously showing the equality of marginal gross benefits) were both incorrect and (2) explanation of the derivation of user costs of current consumption was incomplete and the marginal user cost curve was thereby inaccurately specified. The full model for renewable resource stocks is presented again. The analysis assumes: (1) a planning horizon for the present and the future; (2) an initial resource stock growing by a constant proportion, with all available resource units consumed by the end of 'the future'; (3) knowledge of current and future resource demand curves measuring marginal social benefits (MSB) gained from consumption; (4) constant marginal resource extraction costs (MEC) for each period; and (5) future MSB and MEC expressed in present values, with discount rates reflecting society's time preference. The optimal resource utilization (or conservation) policy is that interperiod allocation pattern which maximizes aggregate net benefit to society from its resource stock, implying a balance between marginal net benefit of consumption in each period. (Lynch-Wisconsin)
W79-02040

THE LIMITED APPLICABILITY OF MARSHALLIAN ECONOMICS TO THE PROBLEM OF POLLUTION ABATEMENT: A SUGGESTED ALTERNATIVE,
Indiana Univ. at South Bend. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-02041

ISSUES IN WATER DEVELOPMENT DECISIONS: A DISCUSSION PAPER,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
G. Levine.
Economic Bulletin for Asia and the Pacific, Vol 27, No 2, p 109-117, December 1976.

Descriptors: *Planning, *Water resources development, *Decision-making, *Planning, *Theoretical analysis, *Irrigation, Flood control, Reservoir design, Drainage, Financing, Multiple-purpose projects, Crop production, Agriculture, Land values, Benefits.

Major issues in water resource development are identified and analyzed. Though emphasizing irrigation, the discussion applies also to flood protection, drainage, and power development. Issues are posed as either/or situations for clarity. A general issue is how uncertainty at the project decision stage and project design stage can be dealt with, including: (1) water-based development vs other bases, (2) utilization of natural rainfall vs irrigation, (3) single vs multi-objectives, (4) autonomous vs directed development, (5) private vs public projects, (6) new projects vs rehabilitation of older ones, (7) large vs small projects, (8) staging and phasing, and (9) who pays--the farmer or 'others'. Uncertainties in decision and design parameters relate to data defining the basic water resources, estimated reservoir storage life, drainage, plant disease, and public health, compounded at the design stage by almost complete exclusion of the human factor in deriving design parameters. Some evidence suggests that more arid areas emphasize directed projects, while in more humid regions autonomy is more common. New projects usually will result in land value increases and changes in crop production, while rehabilitation will have a lesser impact on such aspects. Large projects more efficiently use limited human resources and physical elements, are more easily financed, and generate major benefits even during the construction period. (Lynch-Wisconsin)
W79-02042

THE BUSINESS OF POLLUTION CONTROL - A BED OF ROSES OR THORNS.
For primary bibliographic entry see Field 5G.
W79-02044

ECONOMETRIC ANALYSIS OF ENVIRONMENTAL POLICY: ESTIMATION OF A MODEL OF THE CANADIAN PULP AND PAPER INDUSTRY,
McMaster Univ., Hamilton (Ontario).
R. A. Muller.
Canadian Journal of Economics, Vol 11, No 2, p 263-286, May 1978. 2 tab, 11 ref, 1 append.

Descriptors: *Pulp and paper industry, *Canada, *Mathematical models, *Econometrics, *Pollution abatement, *Economic impact, *Costs, Economics, Model studies, Estimation, Policy, Industrial production, Prices, Newspring, Export, International trade, Input-output analysis, Regulation, Simulation analysis.

An econometric model of the Canadian pulp and paper industry, designed to simulate effects of changes in production costs due to mandatory pollution controls, is specified and estimated. Expected costs of pollution control should not depress output more than 2% if cost increases average about 6%. In simulation runs the model tracked long-term fluctuations in major variables with tolerable accuracy. It consistently demonstrated low sensitivity to random variables, with less than unitary elasticities of major variables with respect to real income changes, unit factor requirement changes, and exchange rate variation. This insensitivity persisted despite a series of modifications of numerical parameters. The main qualitative conclusions remained unchanged when various coefficients were altered by an amount equal to their standard error. The basic model was specified to reflect the oligopolistic nature of the industry. Three product groups were specified--newsprint, woodpulp export, and other paper and board--and a unique output determination model was applied to each. Increase in costs due to any particular environmental policy will vary with the level of treatment adopted, the pulping process used, and characteristics of individual mills. The model is general enough to be potentially useful for such issues as the impact of tax incentives or changes in foreign aggregate demand. (Lynch-Wisconsin)
W79-02046

THE ECONOMIC CONSEQUENCES OF THE 200-MILE SEABED ZONE: THE REPLENISHABLE RESOURCES CASE,

St. Mary's Univ., Halifax (Nova Scotia).
For primary bibliographic entry see Field 6E.
W79-02048

IMPLICATIONS OF ALTERNATIVE MEASURES OF NATURAL RESOURCE SCARCITY,
Washington Univ., Seattle.
G. M. Brown, Jr., and B. C. Field.
Journal of Political Economy, Vol. 86, No. 2, p229-243, April 1978. 2 fig, 1 tab, 31 ref. NSF SIA 75-15189.

Descriptors: *Measurement, *Indicators, *Scarcity, *Natural resources, *Methodology, Economics, Unit costs, Prices, Rents, Mathematical models, Model studies, Costs, Renewable resources, Nonrenewable resources, Marginal discovery costs, Marginal replenishment costs, Technology, Resource extraction, Theoretical analysis,

Three commonly used indicators of natural resource scarcity--unit cost, product output prices, and rental rates--are evaluated as deficient. Rental rates or a proxy--marginal discovery costs--are preferred over the other measures, but none is ideal. In some cases good scarcity indicators may be nonexistent. Barnett and Morse's unit Cost measure, the most commonly cited scarcity index, is ambiguous and mistakes certain types of technological progress for growing natural resource sarcity, mistakes ease of adjustment to increasing scarcity for increasing scarcity itself, is a lagging rather than a leading indicator, and does not reflect expected future discovery or extraction costs. The real price of natural resource-intensive products is somewhat superior to unit cost as it reflects expected discovery and extraction costs, but technical progress distorts its scarcity signal. Real price can rise or fall depending on which price deflator is used to adjust the nominal resource price. Neither real price nor unit cost is a reliable scarcity indicator in common property situationss. Rental rates indicate increasing scarcity in an economic sense, but lack of data renders their use imparctical, and marginal discovery costs (or mariginal replenishment costs in the case of renewable resources) are more useful as indicators. (Lynch-Wisconsin)
W79-02049

MEASUREMENT OF ECONOMIC UNCERTAINTY IN PUBLIC WATER RESOURCE DEVELOPMENT: AN EXTENSION,
California Univ., Santa Barbara. Dept. of Economics.
L. J. Mercer, and W. D. Morgan.
American Journal of Agricultural Economics, Vol. 60, No. 2, p 241-244, May 1978. 1 fig, 2 tab, 8 ref.

Descriptors: *Risks, *Weibull probability distribution, *Cost-benefit analysis, *Methodology, *Water resources development, *Spewrell Dam Project(GA), *Water management(Applied), Analytical techniques, Georgia, Dams, Measurement, Economics, Decision making, Probability, Distribution, Monte Carlo method, Triangular distribution.

Taylor and North's incorporation of economic uncertainty into benefit-cost analysis is extended through utilization of the Weibull probability distribution, which permits great flexibility in input values. The technique's major advantage is that absolute highest and lowest values in the range of input data need not be specified. The Weibull technique can use best estimates of these values, and allows for uncertainty by adjusting the probability of exceeding those values. Further application of these probability assignment procedures is easy and inexpensive. This paper demonstrates that inclusion of uncertainty in benefit-cost analysis need not be limited to triangular distribution. The technique is demonstrated in use with the Spewrell Bluff Dam Project, Georgia; results are compared with those of Taylor and North. Their subjective estimates (most likely, optimistic, and pessimistic) for Spewrell Bluff, obtained from interviews, are the basis for output comparisons of the Weibull distribution and triangular distribution. Input information for the Weibull distribution is combined by the required algorithm for the output measure specified, i.e., net benefits or benefit-cost ratio, and Monte Carlo techniques are used to simulate final output distribution. The outcome is the mean, standard deviation, and minimum and maximum values of the output distribution. (Lynch-Wisconsin)
W79-02050

STABLE TAXATION SCHEMES IN REGIONAL ENVIRONMENTAL MANAGEMENT,
Centro Teoria dei Sistemi, Milan (Italy).
For primary bibliographic entry see Field 5G.
W79-02051

STUDYING THE ECONOMICS OF A WATERWAY: A CRITIQUE OF STUDIES OF THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
D. Allee, and W. Sander.
Paper No 77-10, April 1977. 28 p, 3 fig, 46 ref.

Descriptors: *McClellan-Kerr Arkansas River Navigation System, *Arkansas River, *Regional development, *Inland waterways, *Multiple-purpose projects, *Cost-benefit analysis, Navigation, Barges, Economic impact, Economic efficiency, Oklahoma, Arkansas, Tulsa(OK), Rivers, Economics.

Previous studies of the impact of the McClellan-Kerr Arkansas River Navigation System are reviewed, and priorities for future research are identified. Studies to date have dealt with economic efficiency or direct benefits, and intersector and interregional impact, with little attention to social equity in terms of benefit distribution and cost allocation. The project provides Tulsa, Oklahoma and four other cities with major public port facilities to service barge navigation; also included are flood control, water-based recreation, hydropower, and reliable water supply were additional benefits. Barge transport began in 1970, and by 1974 shipping amounted to 34.2 million tons valued at $500 million. Between 1970-75, 497 new industrial plants or additions were built, and the interstate highway system along the channel was expanded. Recreationists spent $192 million in 1975. Rebuilding the Arkansas River cost about $2 billion at current prices, and operation and maintenance costs are about $20 million per year. Return on invested capital is estimated at 4.0-13.5%. Total benefits appear to have exceeded costs. Of the $1.1 billion (1963 prices) for business inputs (half for labor), over 70% was spent in the region, and the project has generated $2 billion in income (50% in the region). Research needs include: (1) locational response to shifts in transportation cost structure, (2) effects of product demand on sector activity and income, and (3) waterway impact on entrepreneurial capacity. (Lynch-Wisconsin)
W79-02052

WATER UTILIZATION AND REALLOCATION IN CHILE: A STUDY OF THE PIRQUE VALLEY,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
L. L. Parks, and D. E. Hansen.
American Journal of Agricultural Economics, Vol 60, No 2, p 207-213, May 1978. 1 fig, 2 tab, 8 ref.

Descriptors: *Water allocation(Policy), *Water rights, *Water utilization, *Pirque Valley(Chile), *Irrigation, *Chile, Agrarian reform, Water supply, Cost-benefit analysis, Beneficial use, Governments, Policy, Economic efficiency, Agriculture, Linear programming models, Model studies, Economics, Optimization, Income distribution, Equity, Valleys.

Although the 1967 Chilean Agrarian Reform Law's Water Code requires equalization of water rights per-hectare in each homogeneous farming area, data from the Pirque Valley south of Santiago shows that costs of changing water allocations would probably exceed benefits; equal per-hectare water allocation would result in economic inefficiency and a worsened income distribution. While optimum economic water allocation would considerably improve income distribution, aggregate income gains would not exceed 5%. Alternative means of improving current inefficient or inequitable water allocations while maintaining the existing delivery system include: (1) 'turnos', in which water is deverted through one canal branch at a time rather than through all branches simultaneously; (2) increased use of farm reservoirs to capture night flow; and (3) water pricing, especially marginal-cost pricing. Each method has drawbacks, such as shortage of water control gates and damage to the unlined canals (method 1), effects on other canal associations (method 2), and lack of water-measuring devices and excessive transactions costs (method 3). The present system has several advantages, however, and appears in general to be relatively efficient and equitable. (Lynch-Wisconsin)
W79-02053

IS IT TIME TO DO A BENEFIT-COST ANALYSIS FOR THE LOCATION OF A POWER PLANT,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
D. J. Allee.
Paper No 77-15, May 1977. 8 p, 11 ref.

Descriptors: *Power plants, *Sites, *Locating, *Cost-benefit analysis, *Cayuga Lake(NY), *Somerset(NY), Lake Ontario, Lakes, New York, Electric power plants, Environmental effects, Environmental economics, Planning, Decision making, Willingness to pay, Economics.

Benefit-cost analysis for deciding whether to grant a permit to New York State Electric and Gas Corporation for building a coal-fired power plant on Cayuga Lake or on Lake Ontario at Somerset rests on two criteria: (1) whether the power plant (the intermediate good proposal) makes economic sense without considering the impact on natural site values; and (2) whether advantages of locating the plant at Cayuga Lake outweigh the loss in unique natural values. The Somerset site would cost an additional $15 million in higher wage rates and a more expensive configuration for water intake and discharge, compared with Cayuga Lake. Methodology exists for estimating in dollars many nonmarket values required by such analysis, such as willingness of people to pay for the difference in cost between the two sites. Important factors to consider are traffic accidents and delays at grade crossings, increased taxes and expenditures for construction, and the relative uniqueness of the two sites. It is concluded that if benefits of preserving the natural site and benefits of constructing the plant are nearly equal, the decision should be delayed for reconsideration of possible effects, while if benefits of the natural site are significantly greater, the plant should not be located there. Technology is bound to increase the uniqueness of a natural area over time, and income effects will likewise augment the value of such areas. (Lynch-Wisconsin)
W79-02054

MEASURING NATURAL RESOURCES SCARCITY: THEORY AND PRACTICE,
Resources for the Future, Inc., Washington, DC. Quality of the Environment Program.
V. K. Smith.
Journal of the Environmental Economics and Management, Vol. 5, No. 2, p 150-171, 1978. 4 tab, 53 ref.

Descriptors: *Natural resources, *Scarcity, Theoretical analysis, *Methodology, Analytical techniques, *Scarcity indices, Economics, Policy, Econometrics, Static models, Dynamic models, *Model studies, Prices, Economic growth, Mathematical models.

A critique is presented of Barnett and Morse's scarcity indices developed in their study, Scarcity and Growth (1963), which evaluates implications of natural resource availability for economic well-being. Whereas they argued that there is no evi-

dence of growing scarcity of natural resources based on an empirical analysis, the present paper concludes that empirical evidence alone is not sufficient for such a determination. Barnett an Morse relied on two scarcity indices: (1) real unit cost of the particular extractive output, and (2) a price index for extractive outputs relative to the nonextractive sector. These indices are evaluated within comparative static and dynamic frameworks to develop a means of appraising candidate indices, and a simple econometric analysis is given of trend movements in the relative price series for various subsectors and the whole extractive sector. An expanded set of series data is used to reevaluate Barnett and Morse's conclusions. A fundamental problem implicitly ignored in this 'outcome' approach to natural resource scarcity is that it is assumed that all services of natural resources are traded on organized markets; movements in the relative values of nonmarket resources, such as common property environment resources, will not be accounted for in the scarcity indices. (Lynch-Wisconsin)
W79-02059

'THE RELATIONSHIP BETWEEN FIRM AND FISHERY IN COMMON PROPERTY FISHERIES': COMMENT,
Connecticut Coll., New London. Dept. of Economics.
G. R. Visgilio.
Land Economics, Vol. 54, No. 1, p 100-103, February 1978. 1 fig, 1 ref.

Descriptors: *Fisheries, *Economics, *Firms, *Commercial fishing, *Limited entry, *Economic impact, Common property, Model studies, Mathematical models, Equilibrium, Boats, Boat size, Management, Regulation, Output, Marginal costs, Optimization.

Anderson's discussion (1976) of the relationship between firm and industry in a common property fishery is modified to allow for changes in vessel size after introduction of a management scheme restricting the number of vessels, but with no additional controls. Results show that a firm will build bigger boats when the price of effort exceeds its marginal costs in the long run. According to Anderson's model, the level of fishing effort equals the output of an individual fishing vessel, a departure from traditional fishery economic analysis in which vessel output has been depicted in terms of the vessel's catch rate. A graphic representation is used with comparative statics analysis to portray vessel and fishery at the open-access equilibrium and the effort level corresponding to maximum economic yield (MEY) of the fishery. Anderson explains a potential problem inherent in management efforts to achieve MEY by limiting vessel number without also controlling output of effort, but the short-run changes in vessel output identified may understate the magnitude of the management problem when the time period is extended to permit changes in vessel size. It is shown that in the long run each firm or vessel equates price to long-run marginal cost, and therefore constructs the appropriate vessel size or scale of plant. (See also W79-02061) (Lynch-Wisconsin)
W79-02060

'THE RELATIONSHIP BETWEEN FIRM AND FISHERY IN COMMON PROPERTY FISHERIES': REPLY,
Delaware Univ., Newark. Dept. of Economics.
L. G. Anderson.
Land Economics, Vol. 54, No. 1, p 104-105, February 1978. 2 ref., NSF/RANN 75-11205.

Descriptors: *Fisheries, *Economics, *Firms, *Commercial fishing, *Limited entry, *Economic impact, Common property, Model studies, Mathematical models, Equilibrium, Boats, Boat size, Management, Regulation, Marginal costs, Output, Rent, Cost-benefit analysis, Costs, Optimization.

A reply is offered to Visgilio's comments (1978) on the author's paper on a common property fishery in which a management scheme is introduced limiting the number of fishing vessels in order to achieve maximum economic yield. Visgilio predicts that firms will build bigger ships when their number becomes limited, in response to the price of effort exceeding its marginal costs in the long-run. While the present author agrees with comments regarding the long-run cost curves of individual vessels, especially those concerning the long-run marginal costs curves of the fishery as a whole before and after vessel number restriction, he disagrees that the extra effort produced by the larger boats will necessarily result in net losses. It is demonstrated that if the new cost level is lower, and if the new return per unit of effort is higher than the original cost level, it is possible for the new rent to be higher. An economic interpretation of these results is that with initial reduction of optimal-sized vessels, the individual owners will increase profits by expanding production, in the long-run being motivated to obtain a larger boat to produce this higher level of effort at a lower cost. Although there will be too much effort produced from a social point of view, potential net gains in welfare still are possible by producing the added effort at lower cost. (See also W79-02060) (Lynch-Wisconsin)
W79-02061

COSTLY INNOVATION AND NATURAL RESOURCES,
A. J. Robson.
Western Ontario University, London, Ont., Canada, Department of Economics, Research Report 7707, 1977. 3 fig, 12 ref.

Descriptors: *Mathematical models, *Natural resources, *Technology, *Resource depletion, *Nonrenewable resources, Model studies, Renewable resources, Optimization, Economics, Investment, Innovation, Oil, Land, Hydroelectric power, Marginal utility.

An optimal model demonstrates basic symmetry between costly innovation and resource depletion; both phenomena affect the asymptotic growth rate, whereas capital accumulation does not. But there is no simple trade-off between innovation and resource depletion--less-productive innovation can mean faster exploitation of the depletable resouce; a larger output share for the depletable resource can imply less innovation and faster exploitation. Similarly, it is possible that more-efficient innovation can lead to a slower rate of exploitation of the resource. The Rawlsian criterion is treated as a limiting case, under which the rent from the depletable resurce could finance innovation, and no investment should occur. These paradoxes seem to moderate the Rawlsian position. The present paper models costly but continuous innovation, and considers two types of limited natural resources: (1) oil, which has a fixed initial stock and is depletable, and (2) hydroelectric power (or land), wich is in fixed flow supply, and although nondepletable, is equally nonaugmentable. The model assumes a constant fraction of output is used to finance innovation, and the rate of exploitation of the depletable resource is constant. These two factors are shown to be more fundamental than the savings rate since they affect the endogenous (asymptotic) growth rate. (Lynch-Wisconsin)
W79-02062

SOME EXTENSIONS OF THE ECONOMIC THEORY OF EXHAUSTIBLE RESOURCES,
Montana State Univ., Bozeman.
R. Cummings.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, NY. p 1-10, 1977. 15 ref.

Descriptors: *Nonrenewable resources, *Economics, *Theoretical analysis, *Mathematical models, *Resource extraction, Common property, Model studies, Natural resources, Optimization, Timing, Marginal costs, Mining, Economic efficiency.

An analytical model of exhaustible resource extraction describes the optimal time-path of production for a decision-making unit exploiting an exhaustible natural resource under two sets of assumptions: (1) management of production is centralized from a common property source, and (2) the decision-making unit is the firm, assumed to be sole owner of a resource stock as in the theory of the mine. In the first case, profits in the resource area are maximized by equating marginal production costs plus an area-wide user cost among all producing firms (similar to Gordon's requirement for social efficiency in the próduction from mines). Regarding the appropriated exhaustible resource (where costs increase due to cumulative production) the rate of extraction is reduced, the production period is extended, and the percentage rate of growth in marginal profits is reduced. These results extend earlier studies primarily in three ways: (1) with reference to the theory of the mine, the analytical description of the firm's optimal time-path of exploitation under conditions where costs are affected by cumulative production, is expanded and clarified; (2) the optimal time-path of production from a common property resource under central management is contrasted to Smith's industry model; and (3) possible Pareto optimal ramifications of the centrally managed common property resource are suggested. (Lynch-Wisconsin)
W79-02064

OPTIMAL UTILIZATION AND THE CONTROL OF FISHERIES,
A. Scott.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, NY., p 155-173, 1977. 4 fig.

Descriptors: *Fisheries, *Optimization, *Resource allocation, *Commercial fishing, *Fish management, Economics, Common property, Farms, Regulation, Marginal productivity, Use rates, Subsidies, Taxes, Equilibrium, Economic rent, Return(Monetary).

A study of optimal resource allocation in the fishery considers: (1) allocation among industries, (2) four forces affecting landings, and (3) methods of regulation. The first section discusses Gordon's analysis of allocation problems posed by the fishery as a type of common property resource, contrasting fishing and farming. Fishermen have lower incomes than farmers; whereas the farmer's return mixes rent, interest, profit, and wage; the fisherman's return omits rent, and includes a wage which is lower due to low opportunity cost. The fisherman's return also includes some profit and interest, which also are low because the share system gives capital a low return and capital immobility may give it a low opportunity cost. Resource allocation to the fishery may be too generous because of the share system, low mobility, and common property. Forces affecting the return from a particular fishery include: (1) diminishing returns wherein application of more labor time on a given vessel may mean a rise in cost per unit of fishing effort; (2) external diseconomies due to excessive number of vessels; (3) population effect, where extra effort reduces the stock of fish, resulting in permanent reduction of the equilibrium catch; and (4) allocation over time (equilibrium of a fish population with the economic system may take centuries). The section on regulation discusses vessel or fisherman limitations, fishing rights fees (as bids), sole ownership, a tax on the catch, and subsidies. (Lynch-Wisconsin)
W79-02065

OPTIMIZATION AND SUBOPTIMIZATION IN FISHERY REGULATION,
London School of Economics and Political Science (England).
R. Turvey.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, NY., p 175-187, 1977. 4 fig, 8 ref.

Descriptors: *Regulation, *Fisheries, *Optimization, *Commercial fishing, *Economics, Externalities, Model studies, Equilibrium, Costs, Marginal return, Policy, Mesh size, Fishing effort, Marginal productivity, Mathematical models, Fish management, Taxes.

Static analysis of a single-trawl fishery illustrates effects of optimization or suboptimization of resource allocation in fishery regulation. In the case of higher demand, greater employment of industry resources occurs, but with smaller total product. Two problems cause this: (1) While the catch of an individual fisherman is proportionate to his own fishing effort, the same is not true of all fishermen together since each imposes an external diseconomy on the others, and the marginal private product of his fishing effort exceeds the marginal social product. (2) Use of smaller mesh size and thus catching smaller fish reduces the number of large fish to be caught later, and in the long run larger mesh size may lower costs of all fishermen together; again, social and private product diverge. Although it is clear that to achieve optimum resource allocation both variables must be regulated, this is not always the case in practice. Two recommendations: (1) a shift to the eumetric curve, and as an alternative (2) a reduction in fishing effort whenever the fishery is on a falling yield curve. Either will raise the catch and/or reduce costs. A complication of regulation of only one of the variables is that catch will initially be reduced. (See also W79-02067) (Lynch-Wisconsin)
W79-02066

OPTIMIZATION AND SUBOPTIMIZATION IN FISHERY REGULATION: COMMENT,
Minnesota Univ., St. Paul.
J. H. Boyd.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, N.Y., p 189-195, 1977. 2 fig, 1 ref.

Descriptors: *Regulation, *Fisheries, *Commercial fishing, *Optimization, *Economics, Externalities, Model studies, Mathematical models, Equilibrium, Costs, Marginal return, Marginal productivity, Mesh size, Fishing effort, Policy, Fish management, Taxes.

A critique of Turvey's 1964 paper (see W79-02066) on optimization and suboptimization in fishery regulation contends that it may not be optimal to require either or both: (1) a toll or charge per pound of fish caught, and (2) imposition of a legal minimum mesh size to protect immature fish, as stated by Turvey. There are in fact three possible optimizing prescriptions, depending on conditions: (1) no regulation, (2) a toll only, and (3) a toll plus a mesh-size regulation. Further, in the special case where Paretooptimality does require both types of regulation, there is no necessity to institute regulation by fiat to control mesh size; a penalty toll on all fish in a catch smaller than the minimum would accomplish the same end. The chief fault in Turvey's paper is a failure to clearly state the relationship of certain critical, implicit assumptions in his argument to his public policy conclusions. Three common assumptions are here assessed: (1) growth of fish and natural mortality are functions of age; (2) fishing mortality rate (catch) is proportional to effort; and (3) recruitment into the fish stock (number of fish reaching catchable size) is exogenous. In the single-trawl fishery examined, two external diseconomies are identified by Turvey: (1) effort by one fisherman reduces fish available to others; and (2) fish caught when smaller will not be caught later as a larger and more valuable fish, likewise imposing additional costs on the industry. (Lynch-Wisconsin)
W79-02067

GENERAL EQUILIBRIUM WITH A REPLENISHABLE NATURAL RESOURCE,
Arizona Univ., Tucson.
V. L. Smith.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, N.Y., p 197-213, 1977. 7 fig, 5 ref.

Descriptors: *General equilibrium models, *Renewable resources, *Economics, *Natural resources, *Fisheries, *Welfare(Economics), Model studies, Mathematical models, Equilibrium, Groundwater, Hunting, Optimization, Use rates, Common property, Stability, Commercial fishing, Competition, Taxes, Quotas, Regulation, Utility.

Stationary general equilibrium in a two-commodity world is described where one commodity is produced from a common property replenishable resource such as an ocean fishery, hunting ground, or groundwater supply. Principal emphasis is on derivation of the production transformation set and its properties since this is where the effect of common tenure is manifest. Also treated is determination of the number of firms in each industry, allowing an extension of partial equilibrium concepts to general equilibrium. The paper discusses: (1) the competitive economy, (2) Pareto optimality, (3) the relationship of user charges and fishing quotas to Pareto optimality, (4) stability, and (5) allocation of firms between industries. In the competitive economy model welfare is unambiguously measured by the per-capita utility function. The Pareto optimal solution for the economy is obtained by maximizing utility subject to technological and biological constraints to determine fish biomass and the units of appropriated resource. A charge for using the social capital represented by the common property stock of fish can, in principle, be used to internalize the external production costs in the fishery; a quota on the fish catch can serve as an equivalent function. The stability of general competitive equilibrium requires that a change in fish biomass must change biological product less than the total harvest of fish after adjusting fishing labor to the new fish stock. (Lynch-Wisconsin)
W79-02068

MATHEMATICAL MODELS OF A FISHERY,
J. Crutchfield, and A. Zellner.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, N.Y., p 215-228, 1977. 2 ref.

Descriptors: *Mathematical models, *Fisheries, *Economics, *Commercial fishing, *Fish management, *Animal populations, *Production functions, Model studies, Population dynamics, Equations, Private ownership, Halibut, Prices, Demand, Supply, Costs.

Mathematical models of exploited and unexploited fisheries are described, and a microeconomic analysis of the management of a privately owned fish resource is presented. For the unexploited fishery, the basic relationship is: dN/dt=rN(1-N/N sub s), where dN/dt is the instantaneous rate of change of the fish population, N is the population at time t, and r and N sub s are fixed quantities. To account for fishery exploitation, traditional economic considerations are incorporated into the biological model. The higher the price is with a given population the larger the quantity supplied to the market by fishing enterprises; also, the larger the population with a given price, the larger the quantity supplied. The biological constraint indicates that the net rate of change in the population is the natural rate of increase minus the amount taken by man per unit time. Effects of changes in consumer income and technological improvement are incorporated into the model. In maximizing profits, the owner is subject to three constraints: (1) a technological production function relating fishing effort and population to output, (2) a cost function for inputs, and (3) a biological constraint. Besides different specification of the production function, this approach differs from others in that the private owner is not assumed to take a sustained yield, with the result that the profit-maximizing solution depends on the interest rate. (Lynch-Wisconsin)
W79-02069

EXPLOITATION OF COMMON-PROPERTY REPLENISHABLE NATURAL RESOURCES,
University of Western Ontario, London.
C. G. Plourde.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, N.Y., p 229-239, 1977. 2 fig, 18 ref.

Descriptors: *Common property, *Renewable resources, *Fisheries, *Commercial fishing, *Economics, *Regulation, *International law, Externalities, Model studies, Mathematical models, General equilibrium models, Equilibrium, Quotas, Taxes, Optimization, Utility, Natural resources, Biomass.

A general equilibrium model of a two-commodity economy expands the theory of common property resources as applied to commercial fishing. The model assumes one of the two goods is produced using a common property natural resource; optimal exploitation of this resource is expressed as a control problem. Specific results are obtained by assuming restrictive properties on the functions describing biological growth, production of resource product, and social utility. Aspects analyzed are: (1) the model, (2) steady-state equilibrium for interior solutions, (3) the relation of steady-state biomass to other steady-state values, and (4) taxes vs. quotas in industry regulation. Fishing regulation has usually taken the form of seasonal quotas (e.g., halibut). If the quotas equal the maximum sustained yield, there is no a-priori reason for such programs to be optimal since how to achieve a desired steady state is not specified. The model presented here clearly specifies a desired steady state and how to achieve it from any initial point. Dynamic tax rates can be devised which have the same effect as quotas, while having the advantage of signalling changes in parameters. The tax has the effect of internalizing the common property externality through appropriation. Auctioning of fishing rights may be preferable to per-unit taxes. International control is needed. (Lynch-Wisconsin)
W79-02070

A POLLUTED GOLDEN AGE,
Chicago Univ., IL.
For primary bibliographic entry see Field 5G.
W79-02071

ECONOMICS OF WILDERNESS RESOURCES,
V. L. Smith.
In: Economics of Natural and Environmental Resources, Gordon and Breach, New York, NY., p 489-504, 1977. 5 fig, 7 ref.

Descriptors: *Economics, *Environmental economics, *Wilderness areas, *Natural resources, *Resource allocation, *Mathematical models, General equilibrium models, Model studies, Optimization, Scenery, National Parks, National Forests, Public access, Recreation, Recreational facilities, Value, Preservation, Environmental effects, Theoretical analysis, Control theory.

Control theory and stationary general equilibrium theory are used to study a model of public recreational wilderness resources which incorporates such elements as (1) external crowding diseconomies in consumption, (2) deterioration effects of resources use, (3) capacity of the resource for ecological adjustment to use, and (4) the public good aspect of a resource's wilderness value. Several types of equilibria are illustrated and compared: an optimal control solution with and without administrative cost, a corresponding free-use competitive solution, stationary state competitive solutions for undeveloped access technologies, and an optimal solution with administrative cost. Investment in easier access to scenic resources can result in crowding and resource deterioration to the detriment of all users. In many cases, society's best option may be preserving relatively high access costs of wilderness resources. Whereas economic analysis of recreational lands has been primarily concerned with principles and techniques of allocating and valuing land for preservation or recreation as opposed to industrial development, it has neglected managing, developing, and rationing aspects of the use of resources already allocated to recreation. Visitor use of primitive areas has been increasing much faster than use of National Parks in general; Colorado River excursions, for example, have increased 50-fold, compared with a two-fold increase in visits to the Grand Canyon through which it flows. (Lynch-Wisconsin)
W79-02072

FORESTED WETLANDS OF FLORIDA-THEIR MANAGEMENT AND USE,
Georgia State Univ., Atlanta. Dept. of Biology.

C. H. Wharton, H. T. Odum, K. Ewel, M. Duever, and A. Lugo.
Center for Wetlands, Phelps Lab, University of Florida, Gainesville, Report DSP-BCP-19-77, June, 1977. 348 p, 202 fig, 13 tab, Final Report to Florida Division of State Planning, (Tallahassee).

Descriptors: *Wetlands, *Land use, *Planning, *Florida, *Swamps, Economics, Forests, *Management.

For public use, this manual summarizes information on the utility of swamps in maintaining a healthy and economically vital landscape for Florida and similar areas elsewhere. This summary draws on a series of research project on wetlands, regional planning of wetland regions, and especially on detailed studies in regional planning, and indications of their value to economic vitality. The volume is intended for land managers, planners, engineers, and citizens participating in the public process of fitting human settlements into the pattern of nature so as to maximize the total value. (Steiner-Mass)
W79-02112

COMPUTER ASSISTED INSTRUCTION IN NATURAL RESOURCE MANAGEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
For primary bibliographic entry see Field 7C.
W79-02161

GEOGRAPHIC ASPECTS OF THE TERRITORIAL REDISTRIBUTION OF WATER RESOURCES,
Akademiya Nauk SSSR, Moscow. Inst. of Geografii.
For primary bibliographic entry see Field 4A.
W79-02209

PLANNING AND MODELING IN URBAN WATER MANAGEMENT,
Hydrocomp, Inc., Palo Alto, CA.
A. S. Donigian, Jr., and R. K. Linsley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 891, Price codes: A08 in paper copy, A01 in microfiche. Report, October 1978. 163p, 16 fig, 12 tab. 70 ref, append. OWRT C-7090(No. 6222), 14-34-0001-6222.

Descriptors: *Model studies, *Mathematical models, *Urbanization, *Water management(Applied), *Decision-making, *Water resources planning, Flood control, Storm runoff, Water supply, Water quality, Recreation, Environmental effects, *Modeling survey, *Model applications, *Modeling costs, *Obstacles to modeling, Baton Rouge(LA.), DeKalb Co.(GA.), Howard Co.(MD.), Knox Co.(TN.), San Francisco(CA.), Seattle(WA.), Southeastern Wisconsin, Washington, D.C.

The past decade has witnessed the growth of mathematical modeling as a valid method of analysis of water resource problems. Results are described of a survey of 349 planning and public works agencies to evaluate and analyze the use of modeling for the planning and management of urban water problems. The goal was to determine the extent of model usage and the impact of modeling on policy and decision making. Forty-three (43) percent of the agencies indicated involvement in the use of urban water modeling, either directly or through consultants, and 31 percent never considered the use of a water model. Federal or state agencies and consultants were the major sources of urban water models. In 52 percent of 220 model applications described by the agencies, the modeling was considered to have had an impact on the plan or policy ultimately adopted. In essentially all the model applications, the modeling was evaluated as very useful or moderately useful and at least as useful as alternative techniques. Obstacles to modeling and information needs for effective planning are explored as a basis for recommendations to improve the use and effectiveness of modeling in urban water planning and management. The report also documents and examines in detail eight case studies of modeling applications by cities, counties, and regional agencies. The case studies include a variety of model types and water problems to demonstrate the utility of modeling for urban water planning and management.
W79-02288

CONSUMER SURPLUS AND ECONOMIC RENT ESTIMATES OF RECREATION VALUE: AN EMPIRICAL AND THEORETICAL COMPARISON,
Utah State Univ., Logan.
E. R. Meale.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 853, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, 1974. 113 p, 8 fig, 10 tab, 23 ref, 4 append. OWRT C-4371 (No. 9064)(1), 14-31-0001-9064.

Descriptors: *Consumer surplus, *Economic rent, *Recreation, *Economics, Reservoirs, Lakes, *Boating, *Utah, Social values, Water sports, *Recreation demand, Recreation methodology.

Application was made of the consumer surplus and economic rent methods of resource valuation for boating recreation in Utah. Total consumer surplus and economic rent values were estimated for twenty-four boating sites. These values incorporate the relationship existing between the variable use costs and the units of activity associated with the site. The comparison of economic rent and consumer surplus was undertaken through the use of a common mathematical model and empirical observation. Three stages in the calculation procedure were considered in the analysis of the comparison of the two methodologies. The first stage compared the consumer surplus with the economic rent estimation and it was found that the economic rent will exceed the consumer surplus. The second and third stages compared the projected values for an origin visiting a site and the total value for a site. No unique relationship was found between the two resource valuation methodologies. The most significant factors contributing to the inconsistent relationship between economic rent and consumer surplus are the utilization of the number of trips in the economic rent model compared to the number of trips per capita in the consumer surplus model, the constant economic rent per trip compared to the decline in the consumer surplus for an additional trip per capita, and the respective projection factors of the two valuation methodologies.
W79-02290

AN ECONOMIC APPROACH TO WATER SUPPLY PLANNING IN SOUTHEASTERN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. VA. Dept. of Agricultural Economics.
W. B. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 890, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1978. 22 fig, 15 tab, 2 append. OWRT A-076-VA(1).

Descriptors: *Water supply, *Water shortage, *Cost-benefit analysis, Economic efficiency, Water conservation, Waste water treatment, Treatment facilities, *Virginia, Chesapeake(VA), Norfolk(VA), Portsmouth(VA), Virginia Beach(VA), Lake Gaston, Blackwater River, Chowan River, Roanoke River, Appomattox River.

Projected levels of increased use of water in the southeastern Virginia cities of Portsmouth, Norfolk, Virginia Beach, and Chesapeake point to a need for additional sources of water. This research studied principal proposed approaches to this water-supply situation with the objective of developing an economically efficient response, given costs and benefits over time. Specifically, cost-benefit analyses were performed for projected levels of use and for reductions in those levels of use achieved with the use of quotas, price increases, and water-saving devices. An important element of these analyses was the consideration of the costs incurred as a result of waste water treatment with different levels of water use. The levels of the principal types of water use were estimated for each city. This provided a basis for the projection of water demand curves necessary for estimating the value of water. Optimal schedules for the development of additional water sources were derived through the examination of water demand, relative to the costs of operating and expanding water supply and waste water treatment facilities.
W79-02294

PROFILE AND MEASUREMENT OF SOCIAL WELL-BEING INDICATORS FOR USE IN THE EVALUATION OF WATER AND RELATED LAND MANAGEMENT PLANNING,
Texas Transportation Inst., College Station.
P. K. Guseman, and K. T. Dietrich.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper Y-78-2, June 1978. 166 p, 9 fig, 1 tab, 285 ref.

Descriptors: *Land management, *Planning, *Water management(Applied), Water resources development, *Social aspects, Social values, Attitudes, *Social well-being indicators.

As part of the continuing development of the Water Resources Assessment Methodology (WRAM), this report focuses on the Social Well-Being (SWB) account as defined by the Water Resource Council's Principles and Standards. An outline of SWB categories, subcategories, and variables as interpreted from Principles and Standards is included. In addition, for selected variables, definitions, information about measurement, and suggestions for prediction are provided. It is noted that although the set of variables discussed in this report assists in defining SWB, the list is tentative, not exhaustive, and is intended for use within the framework of WRAM. The particulars of each planning study and the judgment of professionals and publics will dictate omission of some variables and inclusion of others. (WES)
W79-02344

NINE FALLACIES OF NATURAL DISASTER: THE CASE OF THE SAHEL,
National Center for Atmospheric Research, Boulder, CO.
M. H. Glantz.
Climatic Change, Vol. 1, p 29-84, 1977. 58 ref.

Descriptors: *Psychological aspects, *Droughts, *Disasters, *Sahel, *Decision making, Project planning, Project post-evaluation, Attitudes, *Social aspects, *Political aspects.

The intent of this analysis is to document the hazards of discussing drought-related issues or forming recovery policies based on generalized and often incorrect beliefs. The generalizations shown to be fallacious in this analysis include: (1) people learn from their mistakes, (2) things will have to change, (3) nomads want to be nomads, (4) when the rains come, everything will return to normal, (5) education is the answer, (6) solutions can be undertaken on a piecemeal basis, (7) political leaders say what they mean, (8) the myth of interdependence, and (9) technology is the answer. When applied to specific situations, the belief in these fallacies is shown to be a hindrance rather than an aid in the understanding of the difficulties involved. Although here applied to the Sahel, the fallacies illustrated by this author can be hazardous in many drought-stricken areas of the world. (Tickes-Arizona)
W79-02398

EVALUATION MODELS FOR PUBLIC MANAGEMENT OF FRESHWATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
J. S. Larson.
In: Transactions of the 40th North American Wildlife and Natural Resources Conference, 1975. p 220-228. Published by Wildlife Management Institute, Wash. D.C. OWRT B-023-MASS(15), 14-31-

0001-3596.

Descriptors: *Model studies, *Wetlands, Economics, Wildlife, Aesthetics, Flood control, Evaluation, Northeastern U.S., *Management, Massachusetts.

An overview is presented of a series of models which assign relative and economic values to freshwater wetlands. Wildlife, visual-cultural, groundwater and flood control values are considered.
W79-02401

IDENTIFICATION AND DELINEATION OF FRESHWATER WETLAND VALUES,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
J. S. Larson.
In: Proceedings: Second Wetlands Conference. January 9, 1974, Stolls, Connecticut. Institute of Water Resources, University of Connecticut, Report No. 24, p 1-10, October 1975. OWRT B-023-MASS(16), 14-31-0001-3596.

Descriptors: *Wetlands, Economics, Wildlife, Aesthetics, Flood control, *Evaluation, Northeast U. S., *Classification, Massachusetts.

The need for and means of delineating values of freshwater wetlands. Examples are given of wetland values as derived from research in Massachusetts.
W79-02402

DEVELOPMENT OF A STREAM-AQUIFER MODEL SUITED FOR MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W79-02450

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE ECONOMICS OF WATER CONSERVATION,
East Bay Municipal Utility District, Oakland, CA.
For primary bibliographic entry see Field 3D.
W79-02022

FINANCING SYSTEM CHANGES,
Black and Veatch, Dallas, TX.
H. J. Graeser.
Journal of American Water Works Association, Vol. 70, No. 9, p 492-495, September 1978. 3 tab, 1 ref.

Descriptors: *Financing, Public utilities, *Water supply, *Dallas(TX), Water management(Applied), *Costs, Local governments, Water resources development, *Texas, Municipal water, Economics, Water purification, Reservoirs, Bond issues, Safe Drinking Water Act, Activated carbon, Regulation, Local financing.

The Dallas, Texas, water utility demosntrates that local financing of water utilities is feasible without government subsidy. The Dallas utility has been operated by the local government with local financing since 1936. Services can be rendered at cost and at the lowest possible price if revenues are available and are protected from diversion to political expedients. Under this system, local citizens pay a fair user charge to the local or regional utility, which can be publicly or privately owned. Dallas had financed water resources development through the year 2000 as well as a system of purification, production, and distribution capable of supplying growth through 1985, through issuance of 20-year revenue bonds with a 1.5 coverage requirement. Water rates were increased only 20-30% in 1951, 1955, 1959, 1969, and 1976. Four reservoirs have been built, also financed with 20-year revenue bonds supported entirely by utility income. While local water rates were higher than most cities in the 1950s ad1960s, today they are almost comparable. In 1974 the average water rate for 60 large U.S. cities was $.13/cu m for 29 cu m/mo, compared with $.18 for Dallas (30% higher). The Dallas rate is now $.20, with the average income from sale of water about $.12/cu m. The economic impact of the Safe Drinking Water Act is illustrated with installation of a granular activated carbon treatment system. (Lynch-Wisconsin)
W79-02023

STRUCTURING WATER UTILITY BOND ISSUES TO COPE WITH INFLATION,
U. J. Schreiner.
Journal of American Water Works Association, Vol. 70, No. 9, p 496-497, September 1978.

Descriptors: *Public utilities, *Bond issues, *Inflation(Economic), *Water supply, *Financing, *Methodology, Municipal water, Water management(Applied), Investment, Capital, Arbitrage bonds, Advance refunding, Regulation, Legal aspects, Utilities, Timing, Interest rates, Economics.

Water utilities can structure bond issues to reduce borrowing costs, taking into account inflation, by means of two methods not widely employed by municipal utilities: arbitrage bonds and advance refundng. Bond issue planning must consider existing tax and water rates and bonds and advance refunding. Bond issue planning must consider existing tax and water rates and bond covenants, bond reserve requirements, market conditions, competing sales, and amount of outstanding bonds. If the money market looks favorable to the utility, the decision will favor long-term financing because of low interest rates on bonds; an unfavorable money market would suggest short-term financing or long-term financing with provision for early call and redemption of the long-term bonds in order to obtain lower interest rates. Project timing would consider availabiity of federal and state grants. In any municipal bond issue, federal regulations on tax-exempt bonds must be considered, especially those on arbitrage bonds in Section 103(c) of the Internal Revenue Code of 1954; the 'temporary period and the 'reasonably required reserve fund' must be understood. Advanced refunding enables an issuer to sell refunding bonds, to use the bond proceeds to buy taxable federal securities, and to place such securities in escrow for payment at or prior to maturity of the bonds being refunded. Advanced funding is useful for lowering net interest rates, reducing principal, consolidating debt, freeing cash reserves, relieving oppressive bond covenants, and avoiding imminent default. (Lynch-Wiscosin)
W79-02024

THE LONG-RUN MOVEMENT OF THE PRICES OF EXHAUSTIBLE RESOURCES,
Sussex Univ., Brighton (England).
G. Heal.
Economics Seminar Paper Series 77/1, 1977. 30 p, 5 fig, 6 ref.

Descriptors: *Nonrenewable resources, *Natural resources, *Economics, *Equilibrium, *Prices, *Theoretical analysis, Reviews, Competition, Model studies, Mathematical models, Substitution, Interest rates, Forecasting, Long-run analysis.

A theory of resource price movements derived from a review of the literature is presented, and empirical studies, primarily by Barnett and Morse and by the present author, are examined to see if they confirm the theory. Earlier literature leads clearly to the following theory: In market equilibrium under either perfect or imperfect competition resource prices will rise in the long run at a rate dependent on (and in some simple cases equal to) the rate of return on other assets, and will continue to move in this fashion until they approach limits set by substitutes costs; to the extent that such costs are influenced by research and development, upper limits they pose are not exogenous, but will depend on expectations about price movements and on the ability of cost-reducing innovators to secure the full social return to their acitivities. The empirical studies cited are far from conclusive about any of the important issues, and the theory therefore remains to be seriously tested. Work by the present author indicates clear connection between resource price movements and interest rates, and the process by which expectations are formed appears very important. The work of Barnett and Morse seems to contradict the a-priori expectations regarding long-run price movements, but factors which could reconcile the difference include increases in known stocks, cost reductions in the production of substitutes, and desequilibrium behavior of markets. (Lynch-Wiscosin)
W79-02026

AN ANALYSIS OF NETWORK COSTS: A STUDY OF SYDNEY'S WATER SUPPLY FROM 1890 TO 2001, PART I: RESEARCH METHODS,
Australian National Univ., Canberra. Research School of Social Sciences.
For primary bibliographic entry see Field 6B.
W79-02033

ECONOMIC EVALUATION OF FOUR SLUDGE DEWATERING DEVICES,
For primary bibliographic entry see Field 5D.
W79-02037

ON THE OPTIMAL POLICY FOR EXPLOITING RENEWABLE RESOURCE STOCKS,
Victoria Univ. of Manchester (England).
For primary bibliographic entry see Field 6B.
W79-02040

THE PRICE OF NATURAL RESOURCES,
B. Csikos-Nagy.
Acta Oeconomica, Vol 18, No 3-4, p 213-225, 1977. 9 tab, 11 ref.

Descriptors: *Natural resources, *Prices, Theoretical analysis, *Oil industry, *Political constraints, *Economics, *International trade, Economic growth, Economic development, Monopoly, Diminishing returns, Rent, Industrialization, Scarcity, Energy, Developing countries, Profit, History, Export.

A historical survey of theories of monopoly rent and diminishing returns and of the development of the price structure of natural resources concludes that oil price is determined primarily by price policies of producers and users motivated by power politics, not by purely price-theoretical criteria. Although diminishing land return during the rest of this century is possible, it appears that natural resource prices will be determined less by input than by scarcity, and by efforts to attain the highest ground (monopoly) rent. Oil is the most important current mining product, and energy may in the near future be the main barrier to economic growth. Multinational companies have generally kept the price of oil below its relative use value in the past, which created a favorable production structure for developed countries and contributed to the financing of industrialization. The price policy was supported by a budgetary policy comprising two major elements: (1) the tariff system in which natural resources are duty-free and tariffs increase with degree of processing; and (2) the consumer price system, in which a part of the ground rent of natural resources is charged at the consumption goods stage, and not at the exploitation stage. Analysis of world market price conditions suggests an increasing trade war since the oil price explosion of 1973, and a solution within the framework of the free market mechanism does not seem likely. (Lynch-Wisconsin)
W79-02045

OPTIMAL AND COMPETITIVE USE OF REPLENISHABLE NATURAL RESOURCES BY OPEN ECONOMIES.
Guelph Univ. (Ontario).
J. J. McRae.
Journal of International Economics, Vol. 8, No. 1, p 29-54, 1978. 5 fig, 22 ref. 1 append.

Group 6C—Cost Allocation, Cost Sharing, Pricing/Repayment

Descriptors: *Economics, *Optimization, *Competition, *Resource allocation, *Renewable resources, *Export, International trade, Welfare(Economics), Consumption, Pontryagin maximum principle, Equilibrium, Decision making, Planning, Production, Natural resources, Model studies, Mathematical models.

Intertemporal and consumption paths of an open economy which exports a replenishable, natural resource-intensive commodity in exchange for a manufactured good are investigated. Along the socially optimal intertemporal consumption path to steady state equilibrium, domestic consumption of resource product will increase if net positive investment in the resource stock is taking place; it will decrease if disinvestment is occurring. With the absence of required markets, the competitive economy will not correctly price the natural resource base. Both the mathematical general equilibrium analysis and the geometric analysis in output space shows that stability of the stationary state depends upon the relationship of marginal technological productivity of the resource base to its marginal biological productivity. In general, optimal steady state equilibrium can occur with any resource mass level; policies which advocate maximum sustained yield are thus not necessarily optimal. A competitive economy myopically groping toward an unknown equilibrium through a series of one-period movements will always, in steady state, produce too little resource product and overproduce the import competing good, or quite possibly underproduce both commodities relative to the optimal steady state point. The market can be forced to behave in an optimal fashion by correctly assigning a user charge on the resource stock, and, if possible, an export tax to obtain the most favorable terms of trade. (Lynch-Wisconsin)
W79-02058

DYNAMIC ANALYSIS OF COMMERCIAL FISHING MODEL,
National Chiao-Tung Univ., Taipei (Taiwan). Dept. of Management.
A. Wang, and K. Cheng.
Journal of Environmental Economics and Management, Vol. 5, No. 2, p 113-127, 1978. 23 fig, 1 tab, 12 ref.

Descriptors: *Dynamic models, *Mathematical models, *Mathematical models, *Renewable resources, *Commercial fishing, *Fisheries, *Equations, Commercial fish, Fishing, Model studies, Quadratic models, Capital, Investment, Economics.

A dynamic, quadratic commercial fishing model is investigated, and results imply that fishing capital investment is nonexplosive, fishery resources are nonextinctive, and the solution of the bionomic system is globally stable within an invariant region. This paper continues the discussion of a quadratic commercial fishing model begun by Smith, and by Leung and Wang. Smith proposed the quadratic differential equation predator-prey (fishing industry-fish) model, and connected economic and ecological factors more efficiently. The present model is restricted to non-time lag investment decision and to the simplest biological equation. The bulk of this paper is devoted to detailed derivations. (Lynch-Wisconsin)
W79-02063

MANAGEMENT OF RURAL WATER SUPPLY PEAK FLOW RATES,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 3D.
W79-02194

6D. Water Demand

URBAN WATER: ACCESS, DELIVERY AND INSTITUTIONAL SCARCITY,
For primary bibliographic entry see Field 6E.
W79-02036

SUBSURFACE STRATIGRAPHY AND WATER RESOURCES OF CASS COUNTY, INDIANA,
Purdue University West Lafayette, Indiana. Department of Geosciences.
For primary bibliographic entry see Field 4B.
W79-02185

CONSUMER SURPLUS AND ECONOMIC RENT ESTIMATES OF RECREATION VALUE: AN EMPIRICAL AND THEORETICAL COMPARISON,
Utah State Univ., Logan.
For primary bibliographic entry see Field 6B.
W79-02290

6E. Water Law and Institutions

URBAN WATER: ACCESS, DELIVERY AND INSTITUTIONAL SCARCITY,
A. Rew.
Sussex University, Institute of Development Studies. IDS Discussion Paper No. 113, 1977. 27 p, 22 ref.

Descriptors: *Scarcity, *Water supply, *Domestic water, *Public access, *Manila(Philippines), *Institutional constraints, *Water allocation(Policy), Equity, Planning, Municipal water, Water delivery, Equitable apportionment, *Philippines, Political constraints, Economics, Urbanization, Costs, Potable water, Water management(Applied), Water demand, Water rights, Water law, Water policy, Water shortage.

Chronic failure to provide domestic water to a significant part of the population of Manila, capital city of the Philippines, is primarily due to institutional considerations rather than to resource scarcity. It is contended that water shortage problems in many if not all countries are due to similar factors. In Manila the immediate problem is caused by the organizational character of the administrative agencies responsible for allocating water. Only those urban groups and individuals with political power succeed in obtaining access to water; the urban poor are excluded with political power succeed in obtaining access to water; the urban poor are excluded from safe and inexpensive water delivery, and urban water systems continue to grow at the expense of rural areas. A possible policy solution is socialization of water resources, or a system more firmly based on ranked beneficial uses of ground and surface water, giving top priority to municipal or community demands for domestic and essential industrial uses. A composite case study is used to demonstrate the problems of access to water in Manila. In many cases, leaks in the distribution system and use of booster pumps contribute to acute water shortages. In 1969 nearly two-thirds of the Manila water supply brought no economic return to the system because over 50% was unmetered and 30% of billings were not collected. The problems are further compounded by accounting confusion and nonfunctional meters. (Lynch-Wisconsin)
W79-02036

THE CHOICE OF EFFICIENT POLLUTION POLICIES: TECHNOLOGY AND ECONOMICS IN THE CONTROL OF SULPHUR DIOXIDE,
London School of Economics and Political Science (England).
For primary bibliographic entry see Field 5G.
W79-02038

THE PRICE OF NATURAL RESOURCES,
For primary bibliographic entry see Field 6C.
W79-02045

A NOTE ON THE WELFARE-ECONOMIC CONSEQUENCES OF EXTENDED FISHING LIMITS,
Bergen Univ. (Norway). Inst. of Economics.
R. Hannesson.
Journal of Environmental Economics and Management, Vol. 5, No. 2, p 187-197, 1978. 2 fig, 5 ref.

Descriptors: *Welfare(Economics), *Economics, *Fishing limits, *Exclusive economic zone, *Law of the Sea, *Commercial fishing, *International law, *International waters, Mathematical models, Models studies, Fisheries, Fish, Prices, Common property, Discount rates, Continental shelf, Fish management, Property rights, Economic efficiency, Fishing, Oceans.

Use of standard two-country two-commodity model to study effects of extending coastal fishing limits shows that the long-term catch will be greater despite seriously overexploited fish stocks; but falling fish prices mean that some if not all of the gains from more efficient fishing will be transferred to consumers in the rest of the world. A United Nations conference is currently considering proposed changes in the Law of the Sea, including the Exclusive Economic Zone, which would give exclusive rights to coastal states over fish and other marine resources in an expanded adjacent sea area. It should not be assumed that the habitat of each fish stock is entirely contained within the fishing limits of the coastal state or that each government will manage the fishery efficiently. In regard to habitat, extended fishing limits would establish joint property rights to fish stocks, and a well-defined group of countries could choose to jointly manage those stocks. As for fishery management, there will be less total gain in efficiency from exclusive fishing rights (none in the limiting case), with coastal countries simply expanding their fishing effort to replace the effort of excluded countries. The basic conclusion is that gains and losses due to exclusive fishing rights are uncertain and vary with each case. (Lynch-Wisconsin)
W79-02047

THE ECONOMIC CONSEQUENCES OF THE 200-MILE SEABED ZONE: THE REPLENISHABLE RESOURCES CASE,
St. Mary's Univ., Halifax (Nova Scotia).
K. S. Chan.
Canadian Journal of Economics, Vol. 11, No. 2, p 314-318, May 1978. 4 ref.

Descriptors: *Economic impact, *Renewable resources, *Fisheries, *Fishing limits, *Exclusive economic zone, *Welfare(Economics), *International law, *International waters, Economics, Law of the Sea, Policy, Optimization, Commercial fishing, Model studies, Mathematical models, Oceans, Two-hundred mile zone.

Effects of a proposed 200-mile seabed zone under consideration by the United Nations Law of the Sea Conference are evaluated for a hypothetical completely independent resource stock (such as fish) in the form of separate 200-mile zones. The analysis modifies the framework developed by Markusen (1976) in a study of two countries sharing a common resource stock. The present analysis suggests that taxing foreign fishermen in domestic waters is better than excluding them, except when the resource good is an import good. An implicit assumption is that the foreign country is entirely passive, and therefore this policy recommendation should be regarded as a set of optimal policies at a certain historic stage. At each farily long historic stage, every country optimizes its national welfare, given the conditions of the previous stage. At the initial stage factory fleets are built as a result of protein shortage and the protected fishing industry of a few industrial nations, which overfish the oceans and move into fishing grounds of less industrial coastal stages, causing external diseconomies to the local fishing industry. In the second stage, coastal states respond by claiming 200-mile economic zones and by implementing various optimal policies. In a future third stage industrial nations may retailiate. (Lynch-Wisconsin)
W79-02048

PRICING AND STANDARDS IN THE CONTROL OF POLLUTION,
York Univ. (England).
For primary bibliographic entry see Field 5G.
W79-02057

THE IDAHO AND MONTANA PROCEDURES FOR OBTAINING WATER USE PERMITS--POSSIBLE SOURCES FOR IMPROVEMENT OF WYOMING LAW, COMMENTS,
Wyoming Univ., Laramie. Coll. of Law.
W. D. Hickey.
Land and Water Law Review, Vol. X, No. 2, p 435-454, 1975. OWRT A-003-WYO(1), 14-31-0001-5051.

Descriptors: *Water law, Idaho, Montana, *Wyoming, Water rights, *Water permits, Water allocation, Legislation, Prior appropriation.

In 1974 the Idaho and Montana legislatures adopted mandatory permit systems for the initiation of water rights in those states. A critical analysis of each statutory scheme is presented and each is compared with existing Wyoming water law. The benefits and disadvantages of each system are weighed in a discussion of six provisions present in one or two of the three statutory schemes. These provisions include such matters as notice and hearing requirements; grounds, including public interest, for issuing or refusing a permit; conditional permits; time limits within which the responsible state agency must act on the permit application, and within which the applicant must perfect the water right; and final proof of the appropriation. Some possible additions to and improvements of existing Wyoming water law are suggested. Nevertheless, it is concluded that the Wyoming procedure provides for efficient administration of the state's water.
W79-02082

CHANGING MANNER AND PLACE OF USE OF WATER RIGHTS IN WYOMING, COMMENTS,
Wyoming Univ., Laramie. Coll. of Law.
D. B. Riggs.
Land and Water Law Review, Vol X, No 2, p 455-476, 1975. OWRT A-003-WYO(2). 14-31-0001-5051.

Descriptors: *Water law, *Wyoming, *Water rights, *Legislation, Diversion, Prior appropriation.

The Wyoming Legislature in 1973 and 1974 altered significantly the method by which Wyoming water users may change the use or place of use of their water rights, as well as the substantive rights of such users to effect changes. These legislative developments are examined against the backdrop of the then existing law and analyzed for potential problems which may arise in their application. The Wyoming Legislature in 1909 enacted the original 'no change' statute. This statute severely curtailed the application of the more liberal common rule which allowed changes in the point of diversion, place of use, and of the use itself, so long as rights of others were not impaired. In the interim, however, the basic statutory 'no change' provision became swallowed by exceptons. While the 1973 and 1974 enactments did not expressly repeal the original 'no change' provision, they at least significantly altered procedures for making changes and, arguably, repealed the provision. Procedures dictated by the new provisions are described. Problems may arise when there are: changes from nonconsumptive to consumptive uses; changes involving the nature of required flow; changes affecting seepage and evaporation; and changes resulting in various types of injuries to other users. Notwithstanding the problems which may arise in the application of the new statutes, a cautious stamp of approval is given to the 1973 and 1974 legislative developments.
W79-02083

PROCEDURAL INCONSISTENCIES AND SUBSTANTIVE ISSUES IN THE FEDERAL RESERVED WATER RIGHTS DOCTRINE. CASE NOTE, UNITED STATES V. AKIN, 504 F.2D 115 (10TH CIR. 1974),
Wyoming Univ., Laramie. Coll. of Law.
T. O. Beppler.
Land and Water Law Review, Vol. X, No. 2, p 477-487, 1975. OWRT A-003-WYO(3), 14-31-0001-5051.

Descriptors: *Water law, *Water rights, Colorado, Wyoming, *Reservation doctrine, *Federal-State water rights conflicts, Legislation, Prior appropriation.

The federal reserved water rights doctrine and some of the procedural and substantive problems which have arisen from its application, are discussed. The Note centers on the dual federal-state system for adjudicating such rights which presently exists in Colorado, and the potential for future inconsistencies in administering federal water rights in states like Wyoming. The procedural duality, resulting from the Akin decision, is unacceptable; federal legislative efforts are necessary in this area. Some flaws existing in proposed federal legislation are described with special examination given to the bill presently offered by the Department of Justice, Land and Natural Resources Division. In relation to substantive areas, the need for quantification of federal reserved water rights, as well as protection for present users of such rights, is indicated.
W79-02084

LAND USE AND RIGHTS IN GROUNDWATER. CASE NOTE, ALAMEDA COUNTY WATER DISTRICT V. NILES SAND AND GRAVEL CO., 37 CAL.APP. 3D 924, 112 CAL.RPTR. 846 (CT.APP. 1974), CERT. DENIED, U.S. 95 S.CT. 128 (1974),
Wyoming Univ., Laramie. Coll. of Law.
W. E. Bergholz, Jr.
Land and Water Law Review, Vol. X, No. 2, p 489-503, 1975. OWRT A-003-WYO(4), 14-31-0001-5051.

Descriptors: *Water law, Groundwater, *Water rights, *California, *Correlative rights doctrine, Prior appropriation, Jurisdiction.

In this case the California Court of Appeals imposed a 'public servitude' on a user of the overlying land in a groundwater basin. The Court then used this 'public servitude' to deny the user inverse condemnation for the flooding of his gravel pits. This Note explores the doctrine of correlative rights as it affects the use of land and water. In addition it discusses alternative methods to reach the result the Court in this case did in both a correlative rights jurisdiction and in prior appropriation jurisdictions.
W79-02085

AN EXAMINATION OF LEGISLATION FOR THE PROTECTION OF THE WETLANDS OF THE ATLANTIC AND GULF COAST STATES,
Mississippi Univ., University. School of Law.
A. J. Haueisen.
Gulf Research Reports, Vol. 4, No. 2, p 233-263, November, 1973.

Descriptors: *Legislation, *Wetlands, *Protection, Legal aspects, Atlantic coastal plain, Gulf coastal plain, Preservation, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas.

Wetlands are defined and the basic ecology of wetlands of this region discussed briefly. Federal laws and the laws of the coastal states are examined to determine what they have done to preserve and utilize these wetlands. A general categorization of the legal approaches various states have taken indicates the following: (1) legislation which enables a state to acquire wetlands or any easement, interest or rights, therein, (2) legislation which prohibits certain activities in wetland areas, (3) the Long Island (NY) Wetlands Act is unique in providing that the State may enter into cooperative agreements with counties to maintain wetlands and may furnish one-half of the cost of maintenance, and (4) legislation not directly related to wetlands but affecting flood plains. A legislation model for a wetlands act is provided and possible implementation of this proposed legislation discussed. (Stihler-Mass)
W79-02106

THE CONTROVERSY CONTINUES: STATE OWNERSHIP OF DRILL RIGS,
Indiana State Board of Health, Indianapolis.
J. M. King.
Water Well Journal, Vol. 30, No. 12, p 63, December, 1978.

Descriptors: *Drilling, *State governments, *Monitoring, Water wells, Water quality, Groundwater.

The advantages of state ownership of drilling rigs are presented. Such ownership is the result of efforts to more effectively implement Federal legislation aimed at water resources protection, an obvious long-term benefit the water well industry. Without their own equipment state agencies must endure the paper work and delay that is usually involved in contracting with a private drilling firm. A significant amount of detailed and critical subsurface information is required where the wells are to be used for enforcement activities. Many water well drillers are neither trained nor equipped to conduct may of the types of logging, sampling and testing needed by regulatory agencies. Government involvement in well construction is limited mainly to water quality surveillance associated with specific enforcement cases and to the installation of scientific data-gathering devices. By actively engaging in preserving ground water quality the government is helping to secure the future of the water well industry. (Purdin-NWWA)
W79-02168

THE NEED FOR PROFESSIONALISM AND ITS ATTRIBUTES IN HYDROGEOLOGY,
R. J. Henning, and J. R. J. Studlick.
Ground Water, Vol. 16, No. 6, p 451-452, November-December, 1978.

Descriptors: *Professional personnel, Hydrogeology, *Employment, *Training, Organizations, Salaries.

Hydrogeology should be considered a profession comparable to engineering and medicine. To be a professional requires proper training, organization and recognition. The training of a hydrogeologist involves interdisciplinary studies and practical experience. The organizational requirement is met by NWWA. Recognition is the most difficult professional attribute to attain because it is subjective. This can be helped by requiring certification of hydrogeologists. Public acceptance and faith in hydrogeology can be gained by publishing more reports on ground water that are concise, clearly written, free of technical jargon, and available to the public at little or no cost. Attendance at professional meetings provides an opportunity to learn a great deal and improve professional confidence. Salaries for hydrogeologists should be on a part with that of engineers and geologists. The NWWA will survey, compile, and make available the facts of employment in the profession. More input is needed from professionals in the form of articles, suggestions and comments. (Purdin-NWWA)
W79-02174

GEOGRAPHIC ASPECTS OF THE TERRITORIAL REDISTRIBUTION OF WATER RESOURCES,
Akademiya Nauk SSSR, Moscow. Inst. of Geografii.
For primary bibliographic entry see Field 4A.
W79-02209

EVAPOTRANSPIRATION ESTIMATES FOR WATER RIGHT TRANSFERS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2D.
W79-02491

6F. Nonstructural Alternatives

WATER UTILIZATION AND REALLOCATION IN CHILE: A STUDY OF THE PIRQUE VALLEY,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-02053

DISASTER RESPONSE TO FLASH FLOOD,
Federal Water Pollution Control Administration, Denver, CO. South Platte River Basin Project.
For primary bibliographic entry see Field 8B.
W79-02193

NINE FALLACIES OF NATURAL DISASTER: THE CASE OF THE SAHEL,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 6B.
W79-02398

A NON-LINEAR PROGRAMMING APPROACH TO FLOODPLAIN MANAGEMENT WITH NON-STRUCTURAL ALTERNATIVES,
Massachusetts Univ., Amherst.
J. L. Kaul, and C. E. Willis.
Southern Journal of Agricultural Economics p 1-7, December 1975. 4 tab, 9 ref. OWRT B-043-MASS(6), 14-31-0001-5081.

Descriptors: *Floodplain management, Decision framework, *Non-structural alternatives, Methodology, *Regional analysis.

The objectives were: (1) to develop a methodology useful to planners at several levels for efficient floodplain management, considering both structural and non-structural measures, and (2) to demonstrate the usefulness of the methodology by applying it to selected floodplain (Farmington, Connecticut) in the Connecticut River Basin. The framework that is developed could provide information for improved decisions, and its applicability is demonstrated. In some regional situations, the variables designated as controls were not controllable under current institutional arrangements. In these cases, solutions can provide implications associated with the maintenance or alteration of these institutional structures.
W79-02400

EVAPOTRANSPIRATION ESTIMATES FOR WATER RIGHT TRANSFERS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2D.
W79-02491

6G. Ecologic Impact Of Water Development

QUANTIFICATION, DECISION-MAKING AND ENVIRONMENTAL IMPACT ASSESSMENT IN THE UNITED KINGDOM.
Aberdeen Univ. (Scotland). Dept. of Geography.
R. Bisset.
Journal of Environmental Management, Vol. 7, No. 1, p 43-58, July, 1978. 3 fig, 2 tab, 31 ref.

Descriptors: *United Kingdom, *Environmental effects, *Decision making, *Planning, *Methodology, *Analytical techniques, Governments, *Environmental Evaluation System, Quantitative matrix system(Sphere), Land use, Cost-benefit analysis, Quantification, Economic development, Economics, Social values, *Evaluation.

Two methods of quantifying and aggregating environmental impacts for evaluating large-scale development projects or governmental policies are analyzed, and both are rejected because they tend to mask contentious issues, and can be used to control debate on the merit of proposals. The methods assessed are: (1) the Environmental Evaluation System (EES) developed for the U.S. Bureau of Land Reclamation, and (2) a quantified matrix developed by Sphere Consultants and used to rank sites for oil production platforms in Scotland. EES is based on a hierarchical checklist of 78 environmental parameters, each of which can be represented numerically. The parameters, each of which can be represented numerically. The parameters are assigned individual weights so that they can be compared and summed. The quantified matrix system, although fully quantified, is crude in comparison with EES. In the matrix, sites are listed horizontally (columns), while factors such as visual intrusion, reinstatement possibility, and land use destruction are listed vertically (rows). Construction impact at each site on all factors is shown by a subjectively derived number (0-5); factors all have equal weight. Ranking is achieved by simply summing columns. Subjective and unsophisticated weightings are then used to test the sensitivity of the ranking. While impact quantification is promoted as a means of countering economic arguments of developers, it is concluded that open discussion of impacts would not be aided by these methods, and their use in the United Kingdom should be opposed. (Lynch-Wisconsin)
W79-02028

NATURAL RESOURCES AND REGIONAL DISPARITIES: A SKEPTICAL VIEW,
For primary bibliographic entry see Field 6B.
W79-02034

IS IT TIME TO DO A BENEFIT-COST ANALYSIS FOR THE LOCATION OF A POWER PLANT,
Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W79-02054

NATURAL RESOURCES AND ENVIRONMENTAL RESTRICTIONS TO GROWTH,
Harvard Univ., Cambridge, MA.
E. Mason.
Challenge, Vol. 20, No. 6, p 14-19, January-February 1978.

Descriptors: *Natural resources *Scarcity, *Pollution abatement, *Costs, *Regulation, *Industrial production, History, Raw materials, Environment, Energy, Welfare(Economics), Economics, Public benefits, Political constraints, Developing countries, Externalities, Gross national product, Paley Commission.

Economic costs and theoretical implications of environmental protection are assessed, and changing attitudes toward use of natural resources are traced. German efforts during World War II to boost military equipment production through substitution, redesign of equipment, collection of scrap, and paring of civilian requirements are used as an example of how metals shortages can be overcome. The Paley Commission Report of 1952 on U.S. national materials policy is also reviewed along with the issue of current materials scarcities and economic growth and the environment. The Paley Commission report concluded that the constraint to economic growth would not be physical limits of discoverable supplies, but rather the real costs of making those supplies available. The report said nothing about the desirability of protecting the environment, and therefore nothing about what such protection would cost. A United Nations study estimated that countries with per capita incomes above $2000 would have to spend 1.4-1.9% of GNP to attain U.S. air, water, and waste disposal standards. The U.S. spent 1.6% of GNP in 1974. Kneese estimates that with expenditures of 5% the GNP until the end of the century developing countries would greatly reduce residuals discharged to the environment, but 2.0-2.5% would seem more realistic; such a rate would mean a reduction in consumption of some goods and services. The world is not facing scarcities of industrial materials, nor even rising costs of such materials in the next century. (Lynch-Wisconsin)
W79-02056

A POLLUTED GOLDEN AGE,
Chicago Univ., IL.
For primary bibliographic entry see Field 5G.
W79-02071

ECONOMICS OF WILDERNESS RESOURCES,
For primary bibliographic entry see Field 6B.
W79-02072

AN EXAMINATION OF LEGISLATION FOR THE PROTECTION OF THE WETLANDS OF THE ATLANTIC AND GULF COAST STATES,
Mississippi Univ., University. School of Law.
For primary bibliographic entry see Field 6E.
W79-02106

THE PRODUCTIVITY OF LAKE CHAMPLAIN WIT REGARD TO WATERFOWL, FURBEARERS, AND OTHER WILDLIFE,
Vermont Dept. of Fish and Game, Montpelier.
For primary bibliographic entry see Field 2H.
W79-02114

YOU CAN TAILOR EFFLUENT BOD TO FIT THE RECEIVING-WATER ECOSYSTEM...AND ENHANCE THE ENVIRONMENT. URBAN AND FISH-PROCESSING WASTES IN THE MARINE ENVIRONMENT: BIOENHANCEMENT STUDIES AT TERMINAL ISLAND, CALIFORNIA,
University of Southern California, Los Angeles. Inst. for Marine and Coastal Studies.
For primary bibliographic entry see Field 5E.
W79-02164

PLANNING FOR OFFSHORE OIL DEVELOPMENT. GULF OF ALASKA OCS HANDBOOK,
Alaska Dept. of Community and Regional Affairs, Juneau. Div. of Community Planning.
For primary bibliographic entry see Field 5G.
W79-02198

ENVIRONMENTAL IMPACT ASSESSMENT: AN AQUATIC BIOLOGIST'S POINT OF VIEW,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
C. E. Herdendorf.
Ohio Journal of Science, Vol. 78, No. 4, p 229-234, July 1978. 1 fig, 1 tab.

Descriptors: *Environmental effects, *Evaluation, *Water pollution effects, *Dredging, *Maumee River(OH), *Maumee Bay(OH), Water management(Applied), Scour, Benthos, Plankton, Bays, Rivers, Lakes, Great Lakes, Ohio, Lake Erie, Ecology, Ecosystems, Gravels, Sands, Methodology, Estuaries, Monitoring, Baseline studies, Sediments, Dissolved oxygen, Fish.

Evaluation of effects of sand and gravel dredging in the Maumee River estuary (Ohio) and Maumee Bay of Lake Erie exemplifies an environmental impact assessment which considers ecological factors. The assessment concludes that the overall impact of dredging activities in the aquatic ecosystem is minor, and the river/bay ecosystem would not be distinctly different in the absence of dredging. Prior to dredging initiation in April 1975 an extensive series of water quality and biological monitoring samples were collected at several sites and analyzed. Continued sand and gravel production would economically benefit the Toledo metropolitan area. Short-term negative effects include: (1) limited hydraulic and water quality impact, (2) minor noise and visual impact, and (3) reduction of benthic and planktonic life forms. Long-term adverse effects would be slight. Dredging would increase both river and bay depths and reduce river velocity, particularly during high runoff and floods, causing sedimentation of silt in excavations. In the bay, waves would break closer to shore, with increased scour 300-600 m from shore. Turbidity would temporarily increase, reducing light

penetration and depth of photosynthetic activity by phytoplankton. Planktonic organisms, including larval fish would be lost if entrained in dredge service water, and benthic forms would be eliminated at dredge sites. (Lynch-Wisconsin)
W79-02222

CYPRESS WETLANDS FOR WATER MANAGEMENT, RECYCLING AND CONSERVATION (THIRD ANNUAL REPORT, NOVEMBER 1, 1975 TO DECEMBER 15, 1976),
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2I.
W79-02256

HYDROLOGY AND WATER BUDGETS OF CYPRESS DOMES,
Florida University, Gainesville, Department of Environmental Engineering Sciences and Center for Wetlands.
For primary bibliographic entry see Field 5B.
W79-02257

HYDROLOGIC BUDGET MODEL,
Florida University, Gainesville, Department of Environmental Engineering Sciences and Center for Wetlands.
For primary bibliographic entry see Field 2H.
W79-02258

HYDROLOGY OF THE AUSTIN CARY CONTROL DOME,
Florida Univ., Gainesville. Dept. of Geology; and Florida Univ., Gainesville, FL. Center for Wetlands.
For primary bibliographic entry see Field 5E.
W79-02260

CHANGES IN UNDERSTORY VEGETATION IN CYPRESS DOMES BROUGHT ABOUT BY FIRE AND ADDITION OF SEWAGE,
Florida Univ., Gainesville. School of Forest Resources and Conservation; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 5C.
W79-02263

COMPARATIVE STUDIES OF CYPRESS ECOSYSTEMS,
Florida Univ., Gainesville. Dept. of Environemental Engineering Sciences; and Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 2H.
W79-02277

DESIGN AND THE DESERT ENVIRONMENT: LANDSCAPE ARCHITECTURE IN THE AMERICAN SOUTHWEST,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 3B.
W79-02389

EFFECTS OF AN ORGANIC ARSENICAL HERBICIDE ON A SALT MARSH ECOSYSTEM,
Auburn Univ., AL. Dept. of Biology; and Auburn Univ., AL. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W79-02427

ECOLOGICAL EFFECTS OF HIGHWAY CONSTRUCTION UPON MICHIGAN WOODLOTS AND WETLANDS: SOIL RELATIONSHIPS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Science.
R. L. McLeese, and E. P. Whiteside.
Journal of Environmental Quality, Vol 6, No 4, p 467-471, 1977. 2 fig, 4 tab, 9 ref.

Descriptors: *Wetlands, *Michigan, *Highway effects, *Drainage effects, Forests, Highways, Soil, Drainage, Soil erosion, Soil management, Hydrology.

Ecological effects of recent highway construction on soils, hydrology, vegetation, and wildlife have been cooperatively evaluated for some common woodland and wetland types in central lower Michigan. A soil inventory was prepared for each area and the highway's impact on the soils was determined. The most significant effects of highway construction on the soil environment were the erosion of soil materials and the alteration of natural soil drainage conditions. Wetland areas are most sensitive to highway construction activities. Natural soil drainage conditions and circulation patterns are easily disrupted at these sites. Methods for predicting potential soil loss and potential changes in natural soil drainage conditions due to highway construction activities are suggested. A soil map of each proposed highway corridor or alternative right-of-way should be available early in planning of proposed highway construction. The soil map can be useful in predicting construction impact on the associated hydrology, plants, and animals in the area. These, in turn, are basic information in evaluating the economic and social impacts of the proposed route on the communities involved. (Steiner-Mass)
W79-02429

PROCEEDINGS OF A WORKSHOP ON THE EVALUATION OF MODELS USED FOR THE ENVIRONMENTAL ASSESSMENT OF RADIONUCLIDE RELEASES.
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W79-02434

7. RESOURCES DATA

7B. Data Acquisition

SYSTEMATIC ABSORBANCE ERRORS WITH TECHNICON AUTOANALYZER II COLORIMETERS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 2K.
W79-02074

NEW METHOD FOR RECORDING HEART AND RESPIRATORY RATES IN CATFISH,
Georgia Inst. of Tech., Atlanta. School of Biology.
R. Strange, J. W. Dean, G. K. Dorman, and D. J. Fletcher.
Science of Biology, Vol. 1, No. 1, p17-18 May, 1975. 1 fig, 3 ref. OWRT B-088-GA(1), 14-31-0001-4071.

Descriptors: *Respiration, *Channel catfish, Fish physiology, *Catfish electrocardiograms.

A simple method of recording heart and respiratory rates in the channel catfish without utilizing implanted electrodes has been developed. This reduces the trauma and likelihood of infections developing from implanted electrodes.
W79-02077

PROCEDURE FOR THE EVALUATION OF ENVIRONMENTAL MONITORING LABORATORIES,
Tracer Jitco, Inc., Rockville, MD.
For primary bibliographic entry see Field 5A.
W79-02149

TELEMETRIC DETERMINATION OF SALMONID WINTER MICRO-HABITAT OCCUPATION AND MOVEMENT IN ICE-COVERED STREAMS,
Wyoming Univ., Laramie.
D. L. Wichers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 701, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, July 1978. 110 p, 19 fig, 9 tab, 58 ref, 3 append. OWRT B-038-WYO(1), 14-34-0001-8130.

Descriptors: *Salmonids, *Aquatic habitats, *Overwintering sites, Brown trout, Ice cover, *Wyoming, Streams, *Instream flow(Winter), Telemetry, *Tracking techniques, *Winter habitats(Trout).

In order to recommend suitable winter instream flows for Wyoming's medium-sized brown trout streams, research was conducted during the fall and winter season, 1977-1978, to determine winter microhabitat occupation preferences and movements of adult brown trout in a totally ice-covered Rocky Mountain stream. Surgically implanted radio transmitters were used for identifying pre-ice resting and feeding locations and resting, feeding, and cover locations during ice-cover. Parameters identified were water depth, mean velocity, point velocity, substrate type, cover type, and ice thickness, when present. Winter microhabitat preferences indicated that brown trout preferred shallower water depths with low mean velocities, under overhead ice-cover. Winter movement data indicated that brown trout have a period of increased activity, usually upstream, after initial ice-cover. Fish appeared to move to more preferred focal areas for over-wintering.
W79-02157

INSTRUMENTS FOR MONITORING THE QUALITY OF NATURAL AND WASTE WATERS,
For primary bibliographic entry see Field 5A.
W79-02214

FULL-SEASON RAIN GAUGE HAVING REPLACEABLE CHARTS FOR MAKING PROFILE GRAPHS,
C. F. Marley.
U.S. Patent No. 4,106,336, 3 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1009, August 15, 1978.

Descriptors: *Patents, *Rain gages, *Instrumentation, Rainfall, Charts, Weather data, Accumulated rainfall.

A full-season rain gauge for outdoor or partial outdoor installation comprises basically a weather-resistant vertically elongated panel, a season-height freeze-proof plastic tube, a shorter single-rain short-time-period plastic rain-gauge tube detachably mounted on the upper end of the season-height tube, and a one-season weather resistant chart for recording accumulated dated rainfall amounts and for subsequent side-by-side positioning to provide a successive-seasons profile graph. The shorter tube is removable after each rainfall or e.g. at weekly intervals. Its contents are then poured into the season-height tube, and the water height is marked and dated on the chart. The rain collector can be mounted at an elevated outdoor locations and can be connected indoors to the rain gauge proper by a small flexible hose. (Sinha-OEIS)
W79-02304

DEVICE FOR MEASURING PH AND TEMPERATURE OF A LIQUID, WHICH INCLUDES A MEMORY,
Dow Chemical Co., Midland, MI. (Assignee).
For primary bibliographic entry see Field 5A.
W79-02316

FLOW MONITORING,
For primary bibliographic entry see Field 8G.
W79-02330

REMOTE SENSING TECHNIQUES AND THE MONITORING OF DESERTIFICATION PROCESSES IN ARID AREAS,
Desert Inst. Ashkhabad (USSR).
N. G. Kharin.
In: Man and the Biosphere, Soviet Committee for the UNESCO Program, p 3-31, 1977. 5 tab, 7 fig.

Descriptors: *Remote sensing, *Monitoring, *Aerial photography, *Desertification, Analytical techniques, Surveys, Terrain analysis, Climatolo-

gy, USSR, Radar, Hydrogeology, Geomorphology, *Turkmen SSR.

When studying the desertification of an area, it is necessary to identify manifestations of all forms of desertification, such as climatic processes (i.e. increases of aridity, reduction of water reserves caused by changes in the macro- and microclimates), hydrogeological processes (i.e. atmospheric precipitation becomes more scarce and the supply of groundwater episodic), morphodynamic processes (i.e. some geomorphological processes become more active including wind erosion of salts, water and wind erosion, transformation of fixed sands into moving sands, etc.), soil processes, phytogenetic processes, and zoogenetic processes, and global scale is discussed and illustrated here. Forming the basis of this analysis are the general principles governing the scale of photography, types of carrier, photographic zones, and methods of photography. Other types of aerial surveys, in particular radar and thermal, are discussed as well. To illustrate these principles, the use of various techniques in the study of the desertification in the arid territories of Turkmenistan are described. (Tickes-Arizona)
W79-02390

QUANTITATIVE MAPPING BY REMOTE SENSING OF AN OCEAN ACID-WASTE DUMP,
National Aeronautics and Space Administration, Hampton, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W79-02407

7C. Evaluation, Processing and Publication

PUBLIC GROUNDWATER SUPPLIES IN KANE COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W79-02075

AN ATLAS OF VASCULAR PLANT SPECIES DISTRIBUTION MAPS FOR TIDEWATER MARYLAND,
Maryland Dept. of Natural Resources, Annapolis. Water Resources Administration.
For primary bibliographic entry see Field 2I.
W79-02109

SOME COMPARISONS OF FLOOD STATISTICS IN REAL AND LOG SPACE,
Geological Survey, Reston, VA. Water Resources Div.; and IBM Thomas J. Watson Research Center, Yorktown Heights, NY.
For primary bibliographic entry see Field 2E.
W79-02119

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div.
D. E. Brown, N. B. Carmony, and R. M. Turner.
Arizona Game and Fish Department Map, 1978. 2 sheets, 171 ref.

Descriptors: *Arizona, *Streams, *Maps, Perennial streams, Intermittent streams, Base flow, Altitude, Wetlands, Aquatic faunas, *Drainage maps.

A map of Arizona (scale 1:1,000,000) documents much of what is known about the types of streams in the State. An accompanying list of references provides a ready guide to the literature on the streams. The map identifies perennial and intermittent streams, and generalized sources of base runoff; shows selected altitude contours of significance with respect to the aquatic faunas; and gives discharge ranges for unregulated streams. (Woodard-USGS)
W79-02121

DIRECTORY OF MEMBER ORGANIZATIONS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, RReston, VA. Water Resources Div.
For primary bibliographic entry see Field 10D.
W79-02123

CHEMICAL QUALITY OF GROUND WATER IN FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Fairfax, VA. Water Resources Div.
J. D. Larson.
Open-file map 78-268, 1978. 2 sheets, 3 tab, 6 ref.

Descriptors: *Water quality, *Groundwater, *Maps, *Water analysis, *Chemical analysis, Data collections, *Virginia, Fairfax County(VA).

Two maps portray the chemical quality of ground water in Fairfax County, Virginia. One map shows dissolved-solids concentration and chemical analyses diagrams. The other indicates hardness and areas of marginal water quality. Three tables of chemical analysis representing the three distinct rock types in the county are presented also. (Woodard-USGS)
W79-02133

POTENTIAL FOR DOWNWARD LEAKAGE TO THE FLORIDAN AQUIFER, GREEN SWAMP AREA, CENTRAL FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
H. F. Grubb.
Water-Resources Investigations 77-71 (open-file report), 1978. 1 sheet, 6 fig, 1 tab, 10 ref.

Descriptors: *Groundwater recharge, *Leakage, *Sand aquifers, *Confined water, *Aquifers, *Maps, Aquicludes, Permeability, Porous media, Natural recharge, Geohydrologic units, Core drilling, Sampling, Mapping, Florida, *Floridan aquifers, *Green Swamp area(Fla).

A qualitative evaluation of the potential for downward leakage from the surficial sand aquifer to the underlying Floridan aquifer was made for the Green Swamp area (about 870 sq mi) in central Florida. Downward leakage, or recharge, is limited under natural conditions owing to the nearness to land surface of the potentiometric surface of both the sand aquifer and the underlying Floridan aquifer. Continuous cores of the unconsolidated section were obtained at 74 sites in the study area and were evaluated for downward leakage potential based on grain-size distribution. Sand percentage was estimated for each interval or bed from microscopic examination of the core samples. The four maps prepared from this data show sand thickness, clay thickness, relative vertical hydraulic conductivity of the confining beds and the relative potential for downward leakage. About 20 percent (178 sq mi) of the area classified has a relatively good potential for downward leakage; almost 50 percent of the area has a relatively poor potential. (Woodard-USGS)
W79-02136

FLOOD-PLAIN DELINEATION FOR CUB RUN BASIN, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Richmond, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-02137

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 1. WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 611, Price codes: A19 in paper copy, A01 in microfiche. Water-Data Report WA-77-1, July 1978. 433 p, 22 fig.

Descriptors: *Washington, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Western Washington.

Water resources data for the 1977 water year for Washington, consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells and springs. This report, in two volumes (western and eastern), contains discharge records for 258 gaging stations; stage only records for 4 gaging stations; stage and contents for 44 lakes and reservoirs; water quality for 162 stations and 7 lakes; and water levels for 173 observation wells. Also included are 146 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Washington. (See also W79-02139) (Woodard-USGS)
W79-02138

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1977--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 612, Price codes: A19 in paper copy, A01 in microfiche. Water-Data Report WA-77-2, July 1978. 419 p, 19 fig.

Descriptors: *Washington, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Eastern Washington.

Water resources data for the 1977 water year for Washington, consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells and springs. This report, in two volumes (western and eastern), contains discharge records for 258 gaging stations; stage only records for 4 gaging stations; stage and contents for 44 lakes and reservoirs; water quality for 162 stations and 7 lakes; and water levels for 173 observation wells. Also included are 146 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Washington. (See also W79-02138) (Woodard-USGS)
W79-02139

WATER RESOURCES DATA FOR TENNESSEE, WATER YEAR 1977.
Geological Survey, Nashville, TN. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 915, Price codes: A23 in paper copy, A01 in microfiche. Water-Data Report TN-77-1, July 1978. 550 p, 6 fig.

Descriptors: *Tennessee, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1977 water year for Tennessee consist of records of stage, discharge, and water quality of streams and springs; stage, contents, and water quality of lakes and reservoirs;

and water levels and water quality of wells. This report contains discharge records for 105 gaging stations; stage only records for one lake gaging station; elevation and contents for 27 lakes and reservoirs; water quality for 134 gaging stations, 99 partial-record flow stations, and 56 wells; and water levels for 32 observation wells. Also included are 116 crest-stage partial-record stations and 35 low-flow partial-record stations. Other data were collected and published for miscellaneous stream and spring sites, or as seepage investigations of discharge and water quality. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Tennessee. (Woodard-USGS)
W79-02140

WATER RESOURCES DATA FOR GEORGIA, WATER YEAR 1977.
Geological Survey, Doraville, GA., Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 732, Price codes: A17 in paper copy, A01 in microfiche. Water-Data Report GA-77-1, July 1978. 375 p, 5 fig.

Descriptors: *Georgia, *Hydrologic data, *Surface waters, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Georgia consist of records of stage, discharge, and water quality of streams; and stage and contents of lakes and reservoirs. This report contains discharge records for 100 gaging stations; stage for 9 gaging stations; stage and contents for 16 lakes and reservoirs; water quality for 19 continuous stations and 110 periodic stations; and peak stage and discharge only for 151 crest-stage partial-record stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Georgia. (Woodard-USGS)
W79-02141

COMPUTER ASSISTED INSTRUCTION IN NATURAL RESOURCE MANAGEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
F. B. Titlow, and R. T. Lackey.
In: Proceedings of the 26th Annual Conference of the Southeastern Association of Game and Fish Commissioners, p 500-505, 1972. 1 fig, 1 tab. OWRT A-049-VA(2).

Descriptors: *Simulation analysis, *Natural resources, Decision making, *Management, Natural resource management, Trout.

Teaching natural resources management is especially difficult because of the importance of experience in making management decisions. Most methods for allowing natural resource students to gain management experience in the classroom have not been entirely satisfactory. Computer implemented simulation of natural resources problems allows educators to provide management experience to students. TROUT, a learning exercise which simulates a coldwater lake fishery, is discussed as an example of the role of these teaching tools.
W79-02161

HIGH PLANS - OGALLALA GROUNDWATER STUDIES,
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 4B.
W79-02172

SUBSURFACE STRATIGRAPHY AND WATER RESOURCES OF CASS COUNTY, INDIANA,
Purdue University West Lafayette, Indiana. Department of Geosciences.
For primary bibliographic entry see Field 4B.
W79-02185

A NON-LINEAR PROGRAMMING APPROACH TO FLOODPLAIN MANAGEMENT WITH NON-STRUCTURAL ALTERNATIVES,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 6F.
W79-02400

HAZARDOUS MATERIAL SPILLS: A DOCUMENTATION AND ANALYSIS OF HISTORICAL DATA,
Factory Mutual Research Corp., Norwood, MA.
For primary bibliographic entry see Field 5G.
W79-02411

8. ENGINEERING WORKS

8B. Hydraulics

TWO DRILLING METHODS COMPARED,
Schultes (A. C.) and Sons, Inc., Woodbury, NJ.
J. F. Schultes, Sr.
The Johnson Drillers Journal, p 2-4, September-October, 1978. 4 fig.

Descriptors: *Drilling, *Water wells, Rotary drilling, Reverse circulation drilling, Specific capacity, Well efficiency, Drawdown, Aquifer tests, *Maryland, *Piney Point aquifer(MD).

Two drilling methods were employed for two wells in the Piney Point aquifer in Maryland which is a non-uniform sand aquifer. The first well was drilled using the mud rotary method. After development its specific capacity was 94 gpm per foot of drawdown which indicates a well efficiency of only 38.3 percent. The second well was drilled using the reverse circulation method and the diameter was increased from 18 to 24 inches. A controlled 24 hour pumping test resulted in a specific capacity of 16.6 gpm per foot of drawdown which indicates that the well efficiency of only 38.3 percent. The second well was drilled using the reverse circulation method and the diameter was increased from 18 to 24 inches. A controlled 24 hour pumping tests resulted in a specific capacity of 16.6 gpm per foot of drawdown which indicates that the well attained an efficiency of almost 100 percent. It was concluded that the reverse circulation drilling method was responsible for the higher efficiency of the second well because it cleans the fine particles of sand from the wall of the hole. (Purdin-NWWA)
W79-02169

REDOX POTENTIAL MEASUREMENTS AS AN INDICATION OF BIOCHEMICAL WELL PLUGGING,
Ground Water Associates, Inc., Arlington, MA.
For primary bibliographic entry see Field 5A.
W79-02170

WATER SYSTEMS BASICS, (1),
For primary bibliographic entry see Field 8C.
W79-02180

DISASTER RESPONSE TO FLASH FLOOD,
Federal Water Pollution Control Administration, Denver, CO. South Platte River Basin Project.
R. L. Berling.
Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers, Vol. 104, No. WR1, Proceedings Paper 14111, p 35-44, November 1978. 9 fig.

Descriptors: *Flash floods, *Colorado, *Disasters, Diversion, Flood control, Rain, Flood data, Floods, Precipitation(Atmospheric), Rainfall, Projects, Storms, *Rocky Mountain National Park, *Emergencies, *Big Thompson River Canyon, Diversion works, Emergency reporting systems.

Extremely heavy rainfall occurred in the Big Thompson River Canyon of Colorado on July 31, 1976. The severe flash flood, which developed in a few hours, claimed 145 lives and caused nearly $40,000,000 in property damage. Several features of the Colorado-Big Thompson water diversion project, located on the river system, played an important role in preventing even greater damage and loss of life. The project operational alert to the disaster came from the personal observation of heavy rainfall and measurement of flood flow in the Estes Park area. Based upon the observed conditions and best judgement, immediate action was taken to place the project system into an emergency mode of operation. A broad-scale program of restoration of water and power facilities was initiated on August 1. A critique of the operation provided first hand experience that could be of value to other water resource managers. (Roberts-ISWS)
W79-02193

OXYGEN TRANSFER AT HYDRAULIC STRUCTURES,
Watson (J. D. and D. M.), London (England).
For primary bibliographic entry see Field 5G.
W79-02202

PRACTICAL RIPRAP DESIGN,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
S. T. Maynord.
Miscellaneous Paper H-78-7, June 1978. 74 p, 24 fig, 10 tab, 2 pl, 14 ref.

Descriptors: *Riprap, *Design, *Design criteria, *Sheer stress, *Shield's design, Engineering structures, Bank stabilization.

Determination of stable riprap size is a problem that has been studied extensively but not yet solved. Existing design methods are based the shear stress exerted by the flowing water on the channel boundaries. The various methods available for computing the shear stress do not agree. Determination of the amount of shear stress a given size riprap can withstand depends upon which investigator's coefficient is used in the Shields' equation. The objective of this investigation was to develop a riprap design procedure based on known or easily calculated variables that properly describes ripra stability. Model tests of riprap stasbility were used in this investigation to insure that the proposed design procedure is applicable to the higher turbulence levels found in decelerating flow in open channels. Design curves for bottom riprap and side slope riprap in straight channels are presented. Tentative criteria for riprap in channel bends are discussed. (WES).
W79-02351

BAY SPRINGS CANAL SURGE STUDY, TENNESSEE-TOMBIGBEE WATERWAY, MISSISSIPPI AND ALABAMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
C. H. Tate, Jr.
Technical Report H-78-9, June 1978. 26 p, 7 pl.

Descriptors: Model studies, *Locks, *Surges, *Tennessee-Tombigbee Waterway(Ala-Miss), Hydraulic models, *Bay Springs Canal(Miss), Mississippi, Alabama.

A 1:80-sale hydraulic model was used to study flow conditions in the canal downstream of the proposed Bay Springs Lock. The original design ad plan of operation caused severe conditions in the canal and required modification of the lock discharge system ad lower approach geometry. Based on the results of this study, the design 2 diffuser and lower approach with a 2-min emptying valve schedurle should provide satisfactory navigation conditions downstream of the project. This design is expected to produce a relatively slow upwelling of the water surface in the lower approach with a maximum height of 2.5 ft and to exert a force of less than 36 tons on a tow similar to that used in the study. (WES)
W79-02352

PHYSICAL MODEL SIMULATION OF THE HYDRAULICS OF MASONBORO INLET, NORTH CAROLINA,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
R. A. Sager, and W. C. Seabergh.
General Investigation of Tidal Inlets (GITI) Report 15, November 1977. Conducted jointly with U.S. Army Coastal Engineering Research Center, Fort Belvoir, Virginia. 552 p, 5 tab, 105 photos, 349 pl, 9 ref.

Descriptors: *Hydraulic similitude, *Hydraulic models, Model studies, *Masonboro Inlet(NC), Fixed-bed models, *Simulation analysis.

Masonboro Inlet was selected as an inlet to determine the usefulness and reliability of physical and mathematical models in predicting hydraulic characteristics of inlet/bay systems. Results obtained from the physical model study are presented. Masonboro Inlet fixed-bed model, constructed to scales of 1:300 horizontally and 1:60 vertically, reproduced an area extending to the -45 ft contour in the Atlantic Ocean and to the nodal points in each interior channel. After model verification tests proved satisfactory, a detailed examination of the effects of waves on model current and tidal height data was made. After testing the 1969 condition, the model was remolded to the November 1964 condition, which represents a time preceding the construction of improvements--a north jetty, a deposition basin, and a dredged channel. Base data were collected, then the improvements were installed upon this condition and tests were run to predict the effect of the improvements on tidal elevations, tidal currents, and wave-induced currents. Fixed-bed model predictions of filling of the dredged navigation channel, filling of the deposition basin, and a tendency for the navigation channel to shift toward the north jetty were substantiated by comparison with the 1966 model results and with prototype data. (WES)
W79-02353

SHOALING CONDITIONS IN SAWYER BEND AND LOWER ENTRANCE TO CHAIN OF ROCKS CANAL, MISSISSIPPI RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. E. Foster, C. M. Noble, and J. J. Franco.
Technical Report H-78-7, June 1978. 68 p, 24 pl, 11 fig.

Descriptors: *Channel improvement, *Sediment transport, *Mississippi River, *Hydraulic models, *Shoaling, *Moveable-bed models, *Sawyer Bend(Mo-Ill), *Chain of Rocks Canal(Mo-Ill), Missouri, Illinois.

Investigates the development of an adequate channel and access to the docking facilities along the right bank in Sawyer Bend and the reduction or elimination of shoaling in the lower entrance to the Chain of Rocks Canal. Shoaling in the lower entrance to the canal during low flows has created a serious problem because of the amount of dredging required and the lack of suitable disposal areas. The purpose of the model study was to develop plans that would provide a satisfactory channel in Sawyer Bend and reduce or eliminate the need for dredging in the lower entrance and approach to the Chain of Rocks Canal. A movable-bed model, constructed to scales of 1:250 horizontally and 1:100 vertically, reproduced the Mississippi River and adjacent overbank areas between miles 191.0 and 180.5. Results indicate development of a satisfactory channel in Sawyer Bend can be accomplished by reducing the amount of flow through the chute channel to the left of Mosenthien Island and forcing the channel to cross toward the right band farther upstream. This could be accomplished with the plan developed on the model and at the same time maintain some flow in the chute channel during all river stages. (WES)
W79-02354

A HYDRAULIC INSTALLATION IN THE WATER SUPPLY SYSTEM OF EMMAUS-NICOPOLIS,
Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 4A.
W79-02394

THE WATER SUPPLY SYSTEM OF CAESAREA MARITIMA,
Y. Olami, and Y. Peleg.
Israeli Exploration Journal, Vol. 27, No. 2-3, p 127-137, 1977. 7 fig, 27 ref.

Descriptors: *Aqueducts, *Paleohydrology, *Hydraulic design, *Structural analysis, *History, Archaeology, Water resources development, Structural design, Construction, Adaptation, Conveyance structures, Dams, Dating, Israel, Water control, Diversion structures.

The water supply system of ancient Caesarea, first described by the Palestine Exploration Fund Survey in the 1870's, is analyzed here. The system is comprised of two distinct water lines, high level and low level aqueducts. The first was fed by two sources, the Shumi springs near the old Roman theater at Miyamis, north of Binyamina, and the springs of the Ammiqam-Avi'el area about 7.5 km northeast of Miyamis. This double-structured aqueduct actually is comprised of two aqueducts joined laterally to accommodate two parallel channels. The low level dam starting at Nahal Tanninim dam near Ma'agan Mikhael is designed to exploit the hundreds of springs from 3.5 to 4m above sea level to the height of at least 5.5 m required to deliver the water to Caesarea. Examination of the entire system reveals evidence of various phases of construction, modification, and repair. The eastern and most ancient part of the system was constructed during Herodian times, followed shortly thereafter by the construction of the western aqueduct, perhaps during the time of Hadrian. The exact dating and chronology for the construction of the component parts of the system are subjects of speculation and argued here. Caesarea and its water supply system was conquered and laid waste by the Mameluke Sultan Baybars in A.D. 1265. (Tickes-Arizona)
W79-02399

8C. Hydraulic Machinery

WATER SYSTEMS BASICS, (1),
E. A. Scott, Jr.
Ground Water Age, Vol. 13, No. 2, p 17-19, October, 1978. 3 fig.

Descriptors: *Water supply, *Water wells, *Pumps, Water sources, Driven wells, Drilled wells, Bored wells, Dug wells, Water pollution, Suction force, Atmospheric pressure, Centrifugal force, Impeller, Shallow wells.

Ground water is preferable to surface water as a source of potable water for private supply systems. It is drawn from wells of various types such as: driven wells, drilled wells, bored wells, and dug wells. Construction techniques and equipment and safety measures against contamination are described for each type of well. Two basic principles involved in pumping of water from wells are: suction force, which is the result of atmospheric pressure, and centrifugal force. Theoretically, suction force could lift water 33.9 feet, but practically, 25 feet is the maximum lift of suction-type pumps. In wells deeper than 25 feet, centrifugal force must be used to bring water to the surface. Centrifugal force underlies the operation of all common water systems pumps--jets, submersible, turbines. In practice, the pump creates centrifugal force with a bladed wheel known as an impeller. Water enters the pump housing and flows outward from the axis. This flow creates a partial vacuum or suction, which brings additional water in through the intake. In simplest form, the intake is connected to the drop pipe into the well. However, this is suitable only for very shallow wells - 15 feet or less. For greater depths a jet pump is commonly used. (See also W79-02181) (Purdin-NWWA)
W79-02180

WATER SYSTEMS BASICS, (2),
A. E. Scott, Jr.
Ground Water Age, Vol. 13, No. 3, p 15-19, November, 1978. 4 fig.

Descriptors: *Jet pumps, *Submersible pumps, *Storage tanks, Water wells, Pumps, Water supply systems, Lightning arresters.

Basic water system pumps and accessories are described in detail. Jet pumps utilize an ejector which draws water continuously through a partial vacuum. They are classified as shallow-well, deep-well, convertible, multi-stage or verticle. Submersible pumps are the fastest growing type. Every submersible has a series of stages arranged on a common shaft. Each stage consists of an impeller and a diffuser. The motor is submerged in the well along with the pump. Submersibles are quiet and ideal for deep wells. Submersible pumps are classified according to diameter, number of electrical cables, and motor design. There are three basic motor types: Hermetically sealed, oil-filled, and non-hermetic waterfilled. Other types of pumps include: piston pumps, working head, and vertical turbine. Pressure tanks store water from the well. Air would waterlog the tank if not controlled by a valve, tank float, or diaphragm. Pressure tanks should be equipped with a pressure switch, pressure gage, relief valve, liquid level control, and foot valve. Wells should be protected from contamination with a well seal or pitless adapter. Lightning arresters protect pump from high voltage surges during thunderstorms. (See also W79-02180) (Purdin-NWWA)
W79-02181

THE IMPACT OF THE USE OF HEAT PUMPS ON GROUNDWATER TEMPERATURES,
Northern Cheyenne Research Project, Lame Deer, MT.
For primary bibliographic entry see Field 4B.
W79-02192

DRIVE DEVICE FOR RAKE ARM WITH ATTACHED SCREEN COMB IN CLEANING DEVICE FOR A WATER CONDUIT SCREEN,
Schrieber GmbH and Co. KG, Langenhagen (West Germany). (Assignee).
S. Rudolph, J. Noring, and A. Schreiber.
U.S. Patent No. 4,107,040, 8 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 973, No 3, p 1247, August 15, 1978.

Descriptors: *Patents, *Cleaning, *Screens, *Filters, Conduits, Conveyence structures, Suspended solids, Equipment, Screen rake.

Devices for the cleaning of screens which are located in a water conduit include a screen rake capable of being moved from an intermediate or rest position above the water surface into a meshing position with the screen, and then into a substantially horizontal position above a collecting bin for emptying. The object of the invention is the development of an improved cleaning device where as low a structural height of the device as possible is maintained, and where the rake arm is operated by a simple, trouble-free mechanical control arrangement. The screen rake is mounted and driven by a chain to be guided in a path so that the screen comb cleans the screen, deposits the screenings in a bin and returns to clean the screen again in a continuous and non-interrupted fashion. The path is formed by a number of connected angle bars which are curved in shape and which are placed between a number of chain wheels around which the chain is wrapped for movement.
W79-02306

HYDRAULIC MODEL TESTS OF THE PROPOSED WEIR FOR THE RICHELIEU RIVER AT ST. JEAN, QUEBEC,
Canada Centre for Inland Waters, Burlington (Ontario).
P. Engel, and Y. L. Lau.

Unpublished Report, Canada Centre for Inland Waters. March, 1977. 22 p. 12 fig, 3 tab, 2 ref.

Descriptors: *Hydraulic models, *Weirs, *Discharge coefficient, Model studies, Design, Engineering, Hydraulic similitude, Testing, Engineering structures.

A model of a proposed weir for the Richelieu River was constructed and tested to obtain the stage-discharge relationship and to investigate if the control of the tailwater level will affect the discharge coefficient. It was found that the discharge coefficient was not affected for flows lower than about 40,000 cu ft/sec. Two modifications of the weir were tested. Both showed significant reduction in scour of the river bed as compared with the original weir design. A horizontal extension of the weir is the recommended modification. The rip-rap protection was designed and tested and found to be stable for the weir with the recommended extension. (Steiner-Mass)
W79-02414

8D. Soil Mechanics

LIQUEFACTION POTENTIAL OF HYDRAULIC FILLS,
Army Engineer District, Los Angeles, CA.
R. M. Pyke, L. A. Knuppel, and K. L. Lee.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 104, No. GT11, Proceedings Paper 14133, p 1335-1354, November 1978. 9 fig, 1 tab, 29 ref.

Descriptors: *Landfills, *Seismic design, *Harbors, *California, Earthquakes, Land use, Dikes, Shore protection, Laboratory tests, Density, *Los Angeles(Calif), *Long Beach(Calif), Hydraulic fills, Liquefaction.

The potential for future earthquake-induced liquefaction in the hydraulic fills of this important harbor area was examined with the aid of several recently proposed detailed and simplified procedures. In addition, the validity of these procedures was assessed by applying them in liquefaction analysis of the hydraulic fills existing in the harbor during the 1933 Long Beach Earthquake. The study suggested that there is something less than a 50% chance of liquefaction occurring during the useful lifetime of these facilities. The consequences of liquefaction will depend on the nature of land at the time. (Visocky-ISWS)
W79-02203

CONSTRUCTION AND OPERATION OF LOW-PRESSURE DAMS ON PERMAFROST SOILS,
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 253, Price codes: A03 in paper copy, A01 in microfiche. Draft Translation 625, July 1977. 25 p, 7 fig, 2 tab, 2 ref.

Descriptors: *Cold weather construction, *Dams, *Earth dams, *Permafrost, Soils, Frozen soils, Freezing, Thawing, Infiltration, Cold regions, Structures, Hydraulic structures, Construction, Reservoirs, Reservoir operation, Engineering, Civil engineering, *USSR.

During the construction and operation of frozen dams, frozen soils may be used for the foundation. However, the foundation soils must not be allowed to thaw. Filtration through the body and foundation of a dam should be completely precluded. Otherwise, losses of the filration resistance and overall strength of the facility will occur. The requirement of ensuring against filtration through the body and foundation of a dam and its abutment with the spillway also must be observed during the construction of dams by the thaw method. Filration eventually promotes the formation of a thaw zone, increased filtration, velocity, and the overall stability of a dam on rocky soil is lost. During the construction of dams on ice-saturated sedimentary soils, the latter must be completely stripped from the foundation if their thickness is insufficient, and replaced with high-quality soils. If the thickness of ice-saturated soils is substantial, then the core of the dam must be filled with less ice-saturated soils. The latter should cut completely through the ice-saturated soils. The dimensions of the spillway should be determined on the basis of careful analysis of the hydrological mode of the stream. Wherever relief permits, the spillway should be built outside of the front created by the dam. Otherwise, filration may occur, altering the thermal mode of the facilities, resulting ininevitable losses of filration resistance. (Sims-ISWS)
W79-02220

8E. Rock Mechanics and Geology

STUDY OF RIVER MEANDERING IN THE SEARCH FOR TECTONIC STRUCTURES (AS EXEMPLIFIED BY THE MIDDLE DNIESTER REGION),
V. Ya. Yeromenko, and V. P. Ivanov.
Soviet Hydrology: Selected Papers, Vol. 16, No. 1, p 9-14, 1977. 4 fig, 3 tab, 18 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 237, p 131-140, 1977.

Descriptors: *Rivers, *Meanders, *Geomorphology, *Structural geology, Analytical techniques, Aerial photography, Geology, Fractures(Geologic), Foreign research, Foreign countries, *USSR, *Dniester River(USSR).

Analysis of river meandering was used to study recent tectonic movements and to identify growing or subsiding crustal structures. River meandering was studied from aerial photographs for the purpose of obtaining information on the morphology and hydraulics of channel flows. According to this method, the rivers are divided into morphologically homogeneous reaches (free meandering, limited meandering, channel processes of the side- and midstream-bar type, rapids, etc.), their quantitative characteristics in the selected reaches are obtained, and their behavior is computed and forecast (change in channel configuration, direction and speed of sediment movement, etc.). The morphometric description of a river reach includes determination of its length, average channel slopes, width of the flood plain and channel, depths, curvature of the river (radius of curvature of the axial line of the channel), the amplitude and length of meanders, number of loops, etc. The investigations showed that some of the meander nodes on the Dniester River and most of the meanders of its middle course tributaries occur in the fracture zones of the crystalline basement lying at a depth to 400 m. (Humphreys-ISWS)
W79-02205

ACID MINE DRAINAGE AND SUBSIDENCE: EFFECTS OF INCREASED COAL UTILIZATION,
Industrial Environmental Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5G.
W79-02409

8F. Concrete

STRENGTH AND BEHAVIOR OF THICK WALED REINFORCED CONCRETE CONDUITS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Ceramic Engineering.
G. C. Ruzicka, W. L. Gamble, and B. Mohraz.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A024 250, Price codes: A09 in paper copy, A01 in microfiche. Report UILU-ENG-76-2004, May 1976. 193 p, 127 fig, 10 tab, 16 ref. DACW-73-72-C-0065.

Descriptors: *Conduits, *Culverts, *Reinforced concrete, *Laboratory tests, Strength, Strength of materials, Testing, Cracks, Reinforcement, Reinforcing steel, Concrete, Hydraulic structures, Concrete structures, Dams, Earth dams, Beams(Structural), Finite element analysis, Engineering, Civil engineering, *Box culverts.

The results of tests of 8 three-opening reinforced concrete conduits designed for soil loadings of 30 k/sq ft were presented and discussed. The test specimens were 3/8 scale models of prototype designs, and were constructed with conventional deformed bars and concrete with 1-inch aggregate. The clear span-depth ratios in critical members ranged from 2.5 to 5.6. External loads were applied in both vertical and horizontal directions simultaneously, so that significant thrusts were acting in all members in addition to the bending and shear forces. Failure loads ranged from 82.5 to 150 k/sq ft vertical load for members with span-depth ratios of 4.0 or less. Horizontal loads of 60 to 75 k/sq ft produced failures in members with span-depth ratios of 5.6. All members failed in shear. A lower bound to the test data was suggested as a function of sq root of (f sub c prime), the span-depth ratio, and the longitudinal compression acting on the member. No strong influence of the reinforcement ratio was found. When other test results were compared, there did not appear to be a strong influence of the moment-shear ratio as expressed by the variable Vd/M. (Sims-ISWS)
W79-02217

DESIGN AND PROOF TEST REQUIREMENTS FOR PRECAST REINFORCED CONCRETE BOX CULVERTS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
H. M. F. Ghanem, and J. P. Lloyd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 297, Price codes: A06 in paper copy, A01 in microfiche. Report FHWA-RD-77-S0613, March 1977. 100 p, 41 fig, 9 tab, 20 ref.

Descriptors: *Culverts, *Reinforced concrete, *Laboratory tests, Strength, Strength of materials, Testing, Cracks, Concrete, Conduits, Hydraulic structures, Drains, Surface drainage, Design, Reinforcement, Reinforcing steel, Engineering, Civil engineering, *Box culverts, Crack control, Proof tests.

The accuracy of a proposed proof test for single cell box culverts was verified by testing 16 full-size specimens. The proof test involved placing a symmetrical arrangement of concentrated loads against the upper and lower slabs. The measured strength was compared to that predicted by yield line theory. It was shown that for culverts reinforced with welded wire fabric, the plastic moment capacity should be used on the tensile strength of the wire. For culverts reinforced with deformed bars, the plastic moment could be based on the yield strength of the reinforcement; however, because of strain hardening, the proof test procedure occasionally underestimated the actual capacity. It was found that the proof test could detect significant deficiencies in either sytle of flexural reinforcement. Efforts to develop a nondestructive proof test based on crack width were unsuccessful. An ancillary study involving 24 beams considered the influence of reinforcement sytle on the width of flexural creacks under sustained loading conditions. It was found that deformed bars provided significantly better crack control than smooth welded wire fabric. (Sims-ISWS)
W79-02218

8G. Materials

DRILLERS FIND INCREASING USE FOR PLASTIC PIPE,
Universa Oil Products, St. Paul, MN. Johnson Div.
J. S. Miller.
The Johnson Drillers Journal, p 5-6, September-October, 1978.

Descriptors: *Well casings, *Plastic pipes, *Well construction, Pressure, Hydrostatic design stress, Corrosion.

Increasing use of plastic casing and screens in water wells is due to their immunity to corrosion, ease of assembly and cutting, light weight, high strength-to-weight ratio, and low cost. However, plastic casing can only be installed in holes that have been drilled by rotary or auger methods since it can't be driven. Plastic casing also requires special handling to avoid knicks, scratches and bends. Since plastic has a lower collapse strength improperly installed gravel pack can cause the casing to collapse. Each diameter of plastic casing is available in a number of wall thicknesses and consequently different interior diameters. There are numerous plastic materials available of various types, grades, and design stress. A formula to determine the pressure rating for any plastic casing is given and the procedure for proper field assembly is discussed. Plastic pipe will never fully replace steel casing but it is another special, useful tool for the professional driller, and another forward step for the well drilling industry. (Purdin-NWWA)
W79-02177

THE DOWNHOLE TV CAMERA CAN 'SEE' WHAT'S WRONG,
Well Surveys Co., Hereford, TX.
R. P. Coneway, and S. Coneway.
The Johnson Drillers Journal, p 1, 12, September-October, 1978.

Descriptors: *Borehole camera, *Water wells, *Subsurface investigations, Inspection, Surveying instruments, Photography.

The downhole, closed-circuit TV camera permits visual inspection of open bore or core holes above and below water. Problems that are pin-pointed include: casing damage or ruptures, encrusted screen areas, corrosion effects, and foreign objects. Accurate pictures can be obtained at depths of 2500 feet under 900 psi in holes as small as 3 1/2 inches. The survey is recorded on video tape with an audio narrative explaining it. The downhole camera is particularly valuable in the redevelopment and rehabilitation of older wells. However, newly completed wells should be surveyed and yearly maintenance and redevelopment programs for municipal, industrial and government wells should specify a survey. (Purdin-NWWA)
W79-02178

A NOTE ON PACKER, SLUG, AND RECOVERY TESTS IN UNCONFINED AQUIFERS,
Tel-Aviv Univ. (Israel). School of Engineering.
G. Dagan.
Water Resources Research, Vol. 14, No. 5, p 929-934, October, 1978. 3 fig, 1 tab, 4 ref.

Descriptors: *Packer tests, *Slug tests, *Recovery tests, *Unconfined aquifers, *Permeability, Hydraulic conductivity, Aquifer characteristics, Aquifer testing, Flow, Numerical analysis, Computer models.

Packer, slug and recovery tests determine the permeability of unconfined aquifers of low hydraulic conductivity. Storativity plays a negligible role since water injected or removed from the wells is of small enough quantity that the water table remains horizontal and the flow steady. The ratios of well length (L) to well radius (rw) and head (H) to rw are larger, while the permeability is low. It is assumed that the formation is homogeneous near the well. Simple computer programs, the method of determining permeability, and graphs applicable to a wide range of parameters are discussed. The flow problem is solved by source distribution along the well axis. This method can be used for more complex configurations such as packer tests in wells inclined with respect to the vertical. The main limitation of the method is the requirement that the length of the active part of the well should be much larger than the well radius. (Purdin-NWWA)
W79-02179

INNOVATIVE WATER SYSTEM SOLVES QUALITY PROBLEM,
Tacoma Dept. of Public Utilities, WA. Water Div.
For primary bibliographic entry see Field 5G.
W79-02183

TIRE MODULE SYSTEMS IN SHORE AND HARBOR PROTECTION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
J. M. Armstrong, and R. C. Petersen.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW4, Proceedings Paper 14182, p 357-374, November 1978. 13 fig, 2 tab, 8 ref.

Descriptors: *Breakwaters, *Shore protection, *Costs, *Protection, Damages, Erosion control, Erosion, Filrers, Harbors, Lakes, Construction, Retaining walls, *Tires, *Modular structures, Cloth, Ice pressure, Waste recycling, Wave damping.

Experimental testing indicated the potential value of using discarded tires as a construction material for low cost shore and harbor protection. The modular assembly methods and use of available connecting materials were examined for an 18-tire module. Engineering design parameters, material cost, and field tests for both floating tire breakwaters and tire revetments were summarized. Floating tire breakwaters were described that provide wave attenuation in marinas and small harbors in both slat and freshwater. Descriptions of two tire revetment test sites on the Great Lakes were presented. Limited monitoring efforts showed that the concept of tire revetment mats seems to hold promise as a low cost approach to certain shore erosion problems. (Roberts-ISWS)
W79-02201

STUDY OF RIVER MEANDERING IN THE SEARCH FOR TECTONIC STRUCTURES (AS EXEMPLIFIED BY THE MIDDLE DNIESTER REGION),
For primary bibliographic entry see Field 8E.
W79-02205

STRENGTH AND BEHAVIOR OF THICK WALED REINFORCED CONCRETE CONDUITS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Ceramic Engineering.
For primary bibliographic entry see Field 8F.
W79-02217

DESIGN AND PROOF TEST REQUIREMENTS FOR PRECAST REINFORCED CONCRETE BOX CULVERTS,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 8F.
W79-02218

DRIVE DEVICE FOR RAKE ARM WITH ATTACHED SCREEN COMB IN CLEANING DEVICE FOR A WATER CONDUIT SCREEN,
Schrieber GmbH and Co. KG, Langenhagen (West Germany). (Assignee).
For primary bibliographic entry see Field 8C.
W79-02306

FLOW MONITORING,
C. A. McClure.
U.S. Patent No. 4,111,044, 7 p 7 fig, 8 ref; Official Gazette of the United States Patent Office, Vol. 974, no 1, p 76, September 5, 1978.

Descriptors: *Patents, *Monitoring, *Measurement, Channels, Open channels, Flow, Channel flow, Flow characteristics, Pneumatic action.

This invention relates to monitoring of liquid flow in a channel open to the atmosphere by means requiring no electrical power. The objects of the invention are accomplished, in a method of monitoring flow in an open channel, by pneumatically sensing pressure of overlying liquid in the channel as depth of such liquid trasmitting changes in the sensed depth at the instance of pneumatic energization of means for doing so, characterizing depth as flow of liquid in the channel, and indicating such liquid flow. The pressure sensing and the transmittal of changes in sensed depth are accomplished pneumatically, via a bubbler tube and bellows plus self-balancing cam-and-valve means for controlling rotation of an air motor. (Sinha - OEIS)
W79-02330

NOVEL COMPOSITIONS OF MATTER FOR USE IN THE TREATMENT OF AQUEOUS SYSTEMS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
For primary bibliographic entry see Field 5F.
W79-02335

OPTIMIZATION AND TESTING OF HIGHWAY MATERIALS TO MITIGATE ICE ADHESION,
Washington State Univ., Pullman.
M. Krukar, and J. C. Cook.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 927, Price codes: A08 in paper copy, A01 in microfiche. Interim Report No EPA-600/2-78-035, March 1978. 156 p, 38 fig, 62 tab, 22 ref, 3 append. R-804660.

Descriptors: *Highway icing, *Paving, *Asphalt, *Materials testing, *Rubber, Laboratory tests, Paints, Freeze-thaw tests, Road construction, Pollution, Toxicity, Ice breakup, Deicers, Snow removal, Pullman, Washington.

The continued development of cost-effective highway coatings, which would reduce the adherence of ice on pavement surfaces is discussed. Formulations of paint/DC 732, DrisSil 73/DC 732, Petroset AT, and Viscopin B were selected on the basis of tests concerning the magnitude and stability of their contact angles, ice release abilities on asphalt and concrete, skid resistance levels on asphalt, durability/wear properties on asphalt and concrete, and environmental contamination potentials. Petroset AT and Viscospin B were applied in two concentration levels in 1.6-in asphalt overlays on the Washington State University (WSU) Test Track for laboratory testing. Data obtained from the WSU Test Track includes: air and surface temperatures; visual observations of water beading and ice release; photographs of coating and substrate conditions; and coating skid values. Various combinations of tire types were used to study their effects. Due to the mild 1976-77 winter, tests were limited, but the data did allow a ranking of the coatings. The three rubberized asphalt sections and the two Petroset asphalt sections were most effective; the best rubberized asphalt section showed reduced abrasion resistance, thus negating its other performance. Petroset, the only formulation deemed toxic, also showed high hydrocarbon runoff levels. It is recommended that more testing be done to confirm the results, to compare existing snow/ice control methods, and to obtain additional traffic wear data. (Davison-IPA)
W79-02408

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Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 8C.
W79-02414

8I. Fisheries Engineering

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State Univ. of New York at Albany Dept. of Biological Sciences.
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W79-02020

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10C. Secondary Publication And Distribution

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For primary bibliographic entry see Field 2L.
W79-02111

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Gulf South Research Inst. Baton Rouge, LA.
For primary bibliographic entry see Field 2L.
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WAPORA, Inc., Charleston, IL. Bioassay Lab.
For primary bibliographic entry see Field 5A.
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10D. Specialized Information Center Services

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M. D. Edwards, and J. M. Nokes.
Open-file report 78-872, 1978. 34 p, append.

Descriptors: *Data storage and retrieval, *Water resources, *Hydrologic data, *National Water Data Exchange(NAWDEX), *Directories, Member organizations.

The National Water Data Exchange (NAWDEX) is a national confederation of water-oriented organizations working to improve access to water data. It consists of member organizations from all sectors of the water-data community. This Directory provides the names, addresses, and telephone numbers of all NAWDEX member organizations and their designated NAWDEX representatives. (Woodard-USGS)
W79-02123

ABALON
Studies
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Beleb
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W79-

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SUBJECT INDEX

ABALONE
Studies on the Effects of the Environment on the Heart Rate of Shellfishes. II. Effects of Temperature, Low Salinity and Hypoxia on the Heart Rate of an Abalone Haliotis (Nordotis) Discus Hannai Ino. (In Japanese),
W79-02497 5C

ABSORPTION
Kinetics of Phosphate Uptake by Aquatic Microorganisms: Deviations from a Simple Michaelis-Menten Equation,
W79-02016 5C

Ammonium Effects on Nutrient Cation Absorption by Wheat,
W79-02021 3F

P-32 Uptake in Lentic Algae,
W79-02078 5C

Kinetics of Algal Transient Phosphate Uptake and the Cell Quota Concept,
W79-02237 5C

The Uptake of Dissolved Organic Matter by a Small Spring Stream,
W79-02248 5C

Uptake, Retention and Loss of Cadmium by Brown Shrimp, (Crangon Crangon),
W79-02463 5B

On the Uptake of Three Different Types of Hydrocarbons by Salmon Eggs (Salmo Salar L.),
W79-02464 5C

Differential Elimination of Phenol by Diatoms and Other Unicellular Algae from Low Concentrations,
W79-02486 5C

ACCIDENTS
Hazardous Material Spills: A Documentation and Analysis of Historical Data,
W79-02411 5G

ACID MINE WATER
Limestone and Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02302 5D

Acid Mine Drainage and Subsidence: Effects of Increased Coal Utilization,
W79-02409 5G

ACID MINE WATER *ACID BASE EQUILIBRIUM
Combination Limestone-Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02150 5D

ACIDS
Atmospheric Formation, Dispersion, and Deposition of Acid Substances,
W79-02015 5A

ACTIVATED SLUDGE
Winery Wastewater Characteristics and Treatment,
W79-02297 5D

Use of the Activated Sludge Process in Purifying Waste Waters from Pulp Production, Especially Kraft Pulp Production (Anwendung des Belebtschlammverfahrens zur Reinigung von Abwaessern aus der Zellstoffproduktion, insbesondere der Sulfatzellstoffproduktion),
W79-02371 5D

Experience with Drum Dryers for Activated Sludge (Opyt naladki barabannykh sushilok aktivnogo ila),
W79-02385 5E

ADAPTATION
Biochemical and Transpiration Studies of the Growth Form of Spartina Alterniflora on Connecticut Salt Marshes,
W79-02101 2I

The Influence of Salinity and Temperature on Growth, Metabolism and Lethal Temperature of the Sand Goby, Pomatoschistus Microps K. (Der Einfluss Von Salzgehalt und Temperatur Auf Wachstum Stoffwechsel und Letaltemperatur Der Strandgrundel Pomatoschistus Microps K.),
W79-02466 5C

Effects of Ingesting Mercury-Containing Bacteria on Mercury Tolerance and Growth Rates of Ciliates,
W79-02499 5C

ADSORPTION
The Uptake of Dissolved Organic Matter by a Small Spring Stream,
W79-02248 5C

Mechanism of Zinc Adsorption by Iron and Aluminum Oxides,
W79-02359 2K

ADVECTION
Simulation Model of Cryptomonas Ovata Population Dynamics in Southern Kootenay Lake, British Columbia,
W79-02225 5C

Advection Modification of the Priestley and Taylor Evapotranspiration Formula,
W79-02395 2D

AERATED LAGOONS
Chemical Foam Control During Effluent Treatment in Aeration Tanks (Khimicheskoe penogashenie pri ochistke stochnykh vod v aerotenkakh),
W79-02382 5D

AERIAL PHOTOGRAPHY
Remote Sensing Techniques and the Monitoring of Desertification Processes in Arid Areas,
W79-02390 7B

AESTHETICS
Design and the Desert Environment: Landscape Architecture in the American Southwest,
W79-02389 3B

AGRICULTURAL RUNOFF
A Systematic Procedure for Taxing Agricultural Pollution Sources,
W79-02219 5G

A Computer Simulation of Phosphate and Nitrogen Transport by Water Runoff,
W79-02251 5B

AGRICULTURE
A Systematic Procedure for Taxing Agricultural Pollution Sources,
W79-02219 5G

AIR ENTRAINMENT
Oxygen Transfer at Hydraulic Structures,
W79-02202 5G

AIR POLLUTION
The Choice of Efficient Pollution Policies: Technology and Economics in the Control of Sulphur Dioxide,
W79-02038 5G

The Business of Pollution Control - A Bed of Roses or Thorns.
W79-02044 5G

AIR POLLUTION CONTROL
Possibilities and Measures in the Pulp Industry in the Interest of Environmental Protection (Moeglichkeiten und Massnahmen der Zellstoffindustrie im Interesse des Umweltschutzes).
W79-02369 5G

Analysis of the Environmental Control Technology for Oil Shale Development,
W79-02432 5G

AIR POLLUTION EFFECTS
Atmospheric Formation, Dispersion, and Deposition of Acid Substances,
W79-02015 5A

Research on Control Technology for Ice Fog From Mobile Sources,
W79-02147 5G

Chemical Characterization of Local and Stratospheric Plutonium in Ohio Soils,
W79-02320 5A

Ethylmercury: Formation in Plant Tissues and Relation to Methylmercury Formation,
W79-02488 5A

AIRBORNE TRANSPORT
Atmospheric Formation, Dispersion, and Deposition of Acid Substances,
W79-02015 5A

ALASKA
Root Production and Root Turnover in a Wet Tundra Ecosystem, Barrow, Alaska,
W79-02100 2I

Planning for Offshore Oil Development. Gulf of Alaska OCS Handbook,
W79-02198 5G

Earthquake-Initiated Changes in the Nesting Habitat of the Dusky Canada Goose,
W79-02416 2I

ALGAE
Copper Sulfate Helps Control Micorganisms in Reservoirs,
W79-02018 5F

P-32 Uptake in Lentic Algae,
W79-02078 5C

Wind Induced Dispersion and Algal Growth in Shallow Lakes,
W79-02226 5G

Differential Elimination of Phenol by Diatoms and Other Unicellular Algae from Low Concentrations,
W79-02486 5C

ALGAL CONTROL
The Role of Silica and the Vernal Diatom Bloom in Controlling the Growth of Nuisance Algal Populations in Lakes,
W79-02152 5C

ALGORITHMS
Coordinating Public Utility Expansion, Industrial Siting and Pollution Control: A Working Dynamic Programming Algorithm,
W79-02039 5G

ALLIGATOR
Effects of Simulated Flooding on Alligator Eggs,
W79-02116 2L

Food Habits of Coastal Marsh Raccoons with Observations of Alligator Nest Predation,
W79-02117 2L

ALLUVIAL CHANNELS
Gradient, Discharge, and Particle-Size Relations of Alluvial Channels in Kansas, With Observations on Braiding,
W79-02120 2J

ALLUVIAL FANS
Structural Control of the Rapids and Pools of the Colorado River in the Grand Canyon,
W79-02200 2E

Mechanism of Formation and Forecast of the Development of the Volga Delta,
W79-02210 2J

ALTERNATIVE COSTS
Economic Evaluation of Four Sludge Dewatering Devices,
W79-02037 5D

ALUMINUM
Effects of Temperature and Time on Hydroxy Aluminum Phosphate-Montmorillonite Complex,
W79-02436 2G

ALUMINUM OXIDES
Mechanism of Zinc Adsorption by Iron and Aluminum Oxides,
W79-02359 2K

AMERICAN ALLIGATOR
Alligator Diets in Relation to Marsh Salinity,
W79-02118 2L

AMERICAN SAMOA
Flow Characteristics of Streams in Tutuila, American Samoa,
W79-02124 2E

AMINO ACIDS
Amino Acids in Salt Marsh Detritus,
W79-02086 5C

AMMONIUM
Ammonium Oxidation and its Significance in the Summer Cycling of Nitrogen in Oxygen Depleted Skan Bay, Unalaska Islanda, Alaska,
W79-02004 5C

The Uptake, Retention, and Release of Ammonium by Reef Corals,
W79-02228 5C

ANAEROBIC CONDITIONS
Ammonium Oxidation and its Significance in the Summer Cycling of Nitrogen in Oxygen Depleted Skan Bay, Unalaska Islanda, Alaska,
W79-02004 5C

ANALYTICAL TECHNIQUES
Quantification, Decision-Making and Environmental Impact Assessment in the United Kingdom.
W79-02028 6G

Flood-Plain Delineation for Cub Run Basin, Fairfax County, Virginia,
W79-02137 2E

An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships of Lakes,
W79-02247 5C

Evaluation of Semipermeable Membranes for Concentration or Organic Contaminants in Drinking Water,
W79-02405 5A

A Statistical Evaluation of Some Columbia River Basalt Chemical Analysis,
W79-02433 5A

ANIMAL DISEASES
Possible Toxic Effects of the Marine Blue-Green Alga, Spirulina Subsalsa, on the Blue Shrimp, Penaeus Stylirostris,
W79-02459 5C

ANIMAL PHYSIOLOGY
Studies on the Effects of the Environment on the Heart Rate of Shellfishes. II. Effects of Temperature, Low Salinity and Hypoxia on the Heart Rate of an Abalone Haliotis (Nordotis) Discus Hannai Ino. (In Japanese),
W79-02497 5C

ANIMAL POPULATIONS
Mathematical Models of a Fishery,
W79-02069 6B

ANNUAL SUCCESSION
Seasonal Changes in the Distribution of Water Fern and Duckweed in Cypress Domes Receiving Sewage,
W79-02262 2I

ANTIMYCIN
Effect of Antimycin on Stream Insects in Field and Laboratory Trials,
W79-02156 5C

ANTITRANSPIRANTS
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

Yield of Dryland Grain Sorghum as Affected by Antitranspirant, Nitrogen, and Contributing Micro-Watershed,
W79-02403 3F

APPLICATION RATES
Lawn Sprinkler Distribution Patterns,
W79-02155 3F

APPROXIMATE THEORY
Water Infiltration into Uniform and Stratified Soils I. Review and Use of an Approximate Theory,
W79-02492 2G

AQUATIC ANIMALS
The Effects of Weed-Cutting on the Macro-Inverterate Fauna of a Canalised Section of the River Hull, A Northern English Chalk Stream,
W79-02002 5C

Aquatic Invertebrate Abundance in Relation to Changing Marsh Vegetation,
W79-02095 2H

The Effects of Perturbation on Cypress Dome Animal Communities,
W79-02279 5C

The Effects of Petroleum on the Salt Marsh Ecosystem,
W79-02485 5C

AQUATIC ENVIRONMENT
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix A: Planktonic Communities, Benthic Assemblages, and Fishery,
W79-02346 5E

Aquatic Disposal Field Investigations Duwamish Waterway Disposal Site Puget Sound, Washington, Evaluative Summary,
W79-02350 5C

AQUATIC HABITATS
Telemetric Determination of Salmonid Winter Micro-Habitat Occupation and Movement in Ice-Covered Streams,
W79-02157 7B

The Effects of Perturbation on Cypress Dome Animal Communities,
W79-02279 5C

AQUATIC INSECTS
Effect of Antimycin on Stream Insects in Field and Laboratory Trials,
W79-02156 5C

AQUATIC LIFE
Macroinvertebrate Sampling Techniques For Streams in Semi-Arid Regions: Comparison of the Surber Method and A Unit-Effort Traveling Kick Method,
W79-02146 5A

AQUATIC PLANTS
The Distribution of Juncus Roemerianus in the Salt Marshes of North America,
W79-02093 2L

Changes in Understory Vegetation in Cypress Domes Brought About by Fire and Addition of Sewage,
W79-02263 5C

Aquatic Vascular Plants of Lake Apopka, Florida,
W79-02420 2I

AQUATIC POPULATIONS
Influence of Silver Carp (Hypophtalmichthys Molitrix) on Plankton of Shallow Waters According to Investigations in Carp Ponds (Wirkungen Von Silberkarpfen (Hypophthalmichtmys Molitrix) Auf Das Plankton in Flachcewassern Nach Untersuchungen in Karpfenteichen),
W79-02457 5C

The Crustacean Zooplankton of Grasmere Before and After a Change in Sewage Effluent Treatment,
W79-02458 5C

AQUATIC WEED CONTROL
The Effects of Weed-Cutting on the Macro-Inverterate Fauna of a Canalised Section of the River Hull, A Northern English Chalk Stream,
W79-02002 5C

Aquatic Plant Management in Semi-Natural Streams: The Role of Marginal Vegetation,
W79-02012 5G

Increasing Efficiency of Aquatic Plant Management Through Processing,
W79-02158 4A

The Colonization of Cabora Bassa, Mocambique, A New Man-Made Lake, by Floating Aquatic Macrophytes,
W79-02231 4A

AQUEDUCTS
A Hydraulic Installation in the Water Supply System of Emmaus-Nicopolis,
W79-02394 4A

The Water Supply System of Caesarea Maritima,
W79-02399 8B

AQUICULTURE
Influence of Silver Carp (Hypophtalmichthys Molitrix) on Plankton of Shallow Waters According to Investigations in Carp Ponds (Wirkungen Von Silberkarpfen (Hypophthalmichtmys Molitrix) Auf Das Plankton in Flachcewassern Nach Untersuchungen in Karpfenteichen),
W79-02457 5C

Possible Toxic Effects of the Marine Blue-Green Alga, Spirulina Subsalsa, on the Blue Shrimp, Penaeus Stylirostris,
W79-02459 5C

Effects of Some Environmental Factors on Growth and Food Consumption of the Baltic Palaemonid Shrimp, Palaemon Adspersus Var. Fabricii (Rathke),
W79-02465 5C

Fish Farms are Having to Watch Their Waste
W79-02474 5G

AQUIFER CHARACTERISTICS
Geology and Groundwater Resources of Northern Berks County, Pennsylvania,
W79-02132 2F

Major Aquifers in Clark County, South Dakota,
W79-02134 2F

AQUIFER MANAGEMENT
High Plans - Ogallala Groundwater Studies,
W79-02172 4B

AQUIFERS
Potential for Downward Leakage to the Floridan Aquifer, Green Swamp Area, Central Florida,
W79-02136 7C

Geophysical Delineation of Buried Glacial River Valley Aquifers in Grundy County, Missouri,
W79-02154 2F

An Evaluation of Isotope Concentrations in the Ground Water of Saudi Arabia,
W79-02254 2F

ARCTIC
Analysis of Error in the Determination of Snow Storage for Small High Arctic Basins,
W79-02197 2C

ARID LANDS
Fossil Ground-Water Gradients in Arid Regional Sedimentary Basins,
W79-02189 2F

ARIZONA
Drainage Map of Arizona Showing Perennial Streams and Some Important Wetlands,
W79-02121 7C

Water Quality of Streamflow from Forested Watersheds on Sedimentary Soils,
W79-02404 5B

ARKANSAS RIVER
Studying the Economics of a Waterway: A Critique of Studies of the McClellan-Kerr Arkansas River Navigation System,
W79-02052 6B

AROCLOR
The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

AROCLOR 1254
Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

ARSENIC
The Pollution of Sea-Water in Nagasaki Bay in Summer 1976 and 1977, (In Japanese),
W79-02482 5B

ARSENICALS (PESTICIDES)
Effects of an Organic Arsenical Herbicide on a Salt Marsh Ecosystem,
W79-02427 5C

ARTEMIA
Effects of Some Environmental Factors on Growth and Food Consumption of the Baltic Palaemonid Shrimp, Palaemon Adspersus Var. Fabricii (Rathke),
W79-02465 5C

ARTIFICIAL RECHARGE
Model Aids Planners in Predicting Rising Ground-Water Levels in San Bernadino, California,
W79-02173 4B

ARTIFICIAL SUBSTRATES
Seasonal Changes in the Epiphyte Community of Natural and Artificial Macrophytes in Lake Memphremagog (QUE. and VT.),
W79-02232 5C

ASBESTOS
Asbestos in the Water Supplies of the Ten Regional Cities, Part I,
W79-02441 5A

ASHTABULA RIVER (OHIO)
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix A: Planktonic Communities, Benthic Assemblages, and Fishery,
W79-02346 5E

ASPHALT
Optimization and Testing of Highway Materials to Mitigate Ice Adhesion,
W79-02408 8G

ATLANTIC COASTAL PLAIN
Geographic Variations in Salt Marsh Macrophyte Productions: A Review,
W79-02098 2H

ATLANTIC OCEAN
Barrier Islands of the Atlantic and Gulf Coasts of the United States: An Annotated Bibliography,
W79-02113 2L

ATMOSPHERE
Atmospheric Formation, Dispersion, and Deposition of Acid Substances,
W79-02015 5A

ATOMIC ABSORPTION
Atomic Absorption Detector for Chromium Organometallic Compounds Separated by High Speed Liquid Chromatography,
W79-02080 5A

A Statistical Evaluation of Some Columbia River Basalt Chemical Analysis,
W79-02433 5A

ATROAZINE
Yield of Dryland Grain Sorghum as Affected by Antitranspirant, Nitrogen, and Contributing Micro-Watershed,
W79-02403 3F

AUSTRALIA
An Analysis of Network Costs: A Study of Sydney's Water Supply from 1890 to 2001, Part I: Research Methods,
W79-02033 6B

AUSTRIA
Possibilities and Measures in the Pulp Industry in the Interest of Environmental Protection (Moeglichkeiten und Massnahmen der Zellstoffindustrie im Interesse des Umweltschutzes).
W79-02369 5G

AUTOMOTIVE EMISSIONS
Research on Control Technology for Ice Fog From Mobile Sources,
W79-02147 5G

AVERAGE FLOW
Gradient, Discharge, and Particle-Size Relations of Alluvial Channels in Kansas, With Observations on Braiding,
W79-02120 2J

AZAARENES
Bioaccumulation Potential and Acute Toxicity of Synthetic Fuels Effluents in Freshwater Biota: Azaarenes,
W79-02241 5C

BACILLUS BREVIS
The Characterization of Bacillus Capable of Blue-Green Bactericidal Activity,
W79-02159 5D

BACTERIA
The Characterization of Bacillus Capable of Blue-Green Bactericidal Activity,
W79-02159 5D

Nitrate Reduction by Denitrifying Bacteria in Single and Two Stage Continuous Flow Reactors,
W79-02406 5D

BACTERICIDES
The Characterization of Bacillus Capable of Blue-Green Bactericidal Activity,
W79-02159 5D

BAHIAGRASS
Differential Effect of Bermuda and Bahiagrasses on Soil Chemical Characteristics,
W79-02381 3F

BALTIC SEA
Seiches in the Baltic Sea and Their Effect on Floods in the Neva River Delta,
W79-02213 2L

Further Data on Heavy Metals and Organochlorines in Marine Mammals from German Coastal Waters,
W79-02460 5B

BARITE
Effect of Barite (BASO4) on Development of Estuarine Communities,
W79-02484 5C

BARIUM COMPOUNDS
Effect of Barite (BASO4) on Development of Estuarine Communities,
W79-02484 5C

BARK FILTERS
Bark as a Medium for Gravity Dewatering of Secondary Sludge from Pulp and Paper Mills,
W79-02186 5D

BARNEGAT BAY (NJ)
Effects of Thermal Discharges on Mortality of Mercenaria Mercenaria in Barnegat Bay, New Jersey,
W79-02473 5C

BARRIER ISLANDS
Barrier Islands of the Atlantic and Gulf Coasts of the United States: An Annotated Bibliography,
W79-02113 2L

BASALTS
The Nature of Basalt Weathering in Israel,
W79-02238 2G

A Statistical Evaluation of Some Columbia River Basalt Chemical Analysis,
W79-02433 5A

BASE FLOW
Role of Ground Waters in the Formation of the Total Runoff of a Small Drainage Basin in the Forest Zone,
W79-02211 4B

BASELINE STUDIES
Establishment of Native Plants for the Rehabilitation of Paraho Processed Oil Shale in an Arid Environment,
W79-02391 4A

BASIC DATA COLLECTIONS
Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay,
W79-02223 5C

BAY SPRINGS CANAL (MISS)
Bay Springs Canal Surge Study, Tennessee-Tombigbee Waterway, Mississippi and Alabama; Hydraulic Model Investigation,
W79-02352 8B

BAYS
Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay,
W79-02223 5C

BEACHES
Soft-Shore Macrobenthos Along the South-West Coast of Wales,
W79-02240 5C

The Urquiola Oil Spill, La Coruna, Spain: Impact and Reaction on Beaches and Rocky Coasts,
W79-02500 5C

BELGIUM
Coefficients of Pollution: Interindustry Linkage and Pollution in Belgium,
W79-02031 5G

BENTHIC FAUNA
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix A: Planktonic Communities, Benthic Assemblages, and Fishery,
W79-02346 5E

BENTHIC FLORA
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix A: Planktonic Communities, Benthic Assemblages, and Fishery,
W79-02346 5E

BENTHIS FAUNA
Soft-Shore Macrobenthos Along the South-West Coast of Wales,
W79-02240 5C

BENZIDINE
Benzidine: Wastewater Treatment Technology,
W79-02445 5D

BENZOPYRENE
On the Uptake of Three Different Types of Hydrocarbons by Salmon Eggs (Salmo Salar L.),
W79-02464 5C

BERMUDAGRASS
Differential Effect of Bermuda and Bahiagrasses on Soil Chemical Characteristics,
W79-02381 3F

BEST MANAGEMENT PRACTICES
Best Management Practices to Control Nonpoint-Source Pollution from Agriculture,
W79-02233 5G

BIBLIOGRAPHIES
A Review of the Biology, Ecology, and Management of Scirpus Olneyi, Volume I: An Annotated Bibliography of Selected References,
W79-02110 2I

A Bibliography of Maryland's Tidal Wetlands (Marshes-Swamps),
W79-02111 2L

Barrier Islands of the Atlantic and Gulf Coasts of the United States: An Annotated Bibliography,
W79-02113 2L

Considerations in Conducting Bioassays,
W79-02349 5A

Storm and Combined Sewer Pollution Control Program Reports. Research, Development, and Demonstration Grant, Contract, and In-House Project Reports.
W79-02442 5G

BIG THOMPSON RIVER CANYON
Disaster Response to Flash Flood,
W79-02193 8B

BILGE WATER
Filration System,
W79-02332 5D

BIOACCUMULATION
Bioaccumulation Potential and Acute Toxicity of Synthetic Fuels Effluents in Freshwater Biota: Azaarenes,
W79-02241 5C

Polychlorinated Biphenyls in Coastal Marine Zooplankton: Bioaccumulation by Equilibrium Partitioning,
W79-02242 5C

Uptake, Retention and Loss of Cadmium by Brown Shrimp, (Crangon Crangon),
W79-02463 5B

On the Uptake of Three Different Types of Hydrocarbons by Salmon Eggs (Salmo Salar L.),
W79-02464 5C

Determination of Methylmercury in Fish of South Carolina,
W79-02478 5A

Organchlorines in Codfish from Harbours Along the Norwegian Coast,
W79-02479 5C

BIOASSAY
Effect of Antimycin on Stream Insects in Field and Laboratory Trials,
W79-02156 5C

Considerations in Conducting Bioassays,
W79-02349 5A

Fish Test With Golden Orfe -- Testing the Toxicity of Matter Contained in Water (Fischtest mit Goldorfen -- Pruefung der Toxizitaet von Wasserinhaltsstoffen),
W79-02375 5C

Growth-Influencing Substances in Sediment Extracts from a Subtropical Wetland: Investigation Using a Diatom Bioassay,
W79-02476 5C

BIOCHEMICAL OXYGEN DEMAND
Significance of Nitrification in Stream Analysis-Effects on the Oxygen Balance,
W79-02001 5C

Water Quality of Cypress Domes: Routine Sampling Program,
W79-02269 5C

Toxicity, BOD, and Color of Effluents from Novel Bleaching Processes,
W79-02374 5C

Possibilities for Reducing COD and 5-Day BOD in Waste Waters from the Pulp and Viscose Rayon Fiber Industries (Moeglichkeiten zur Reduktion des CSB und BSB(5) in den Abwaessern der Zellstoff- und Viskosefaserindustrie),
W79-02376 5D

BIODEGRADATION
Conversion of Lignosulfonates in Natural Waters (Prevrashchenie lignosul'fonatov v prirodnykh vodakh),
W79-02379 5B

BIOENHANCEMENT
You Can Tailor Effluent BOD to Fit the Receiving-Water Ecosystem...and Enhance the Environment. Urban and Fish-Processing Wastes in the Marine Environment: Bioenhancement Studies at Terminal Island, California,
W79-02164 5E

BIOINDICATORS
Application of a Model of Zooplankton Composition to Problems of Fish Introductions to the Great Lakes,
W79-02020 5C

Macroinvertebrate Sampling Techniques For Streams in Semi-Arid Regions: Comparison of the Surber Method and A Unit-Effort Traveling Kick Method,
W79-02146 5A

The Response of Benthic Invertebrate Populations to Sewage Addition,
W79-02267 5C

BIOLOGICAL COMMUNITIES
Effect of Barite (BASO4) on Development of Estuarine Communities,
W79-02484 5C

BIOLOGICAL MEMBRANES
On the Uptake of Three Different Types of Hydrocarbons by Salmon Eggs (Salmo Salar L.),
W79-02464 5C

BIOLOGICAL TREATMENT
Minnesota's Peat Resources: Their Characteristics and Use in Sewage Treatment, Agriculture, and Energy,
W79-02255 5G

Planning and Startup of a Flexible Activated Sludge Installation (Bioflex Process) as a Biological Clarification Stage in a Board Mill (Planung und Inbetriebnahme einer flexiblen Belebtschlammanlage (Bioflex-Verfahren) als biologische Klaerstufe einer Kartonfabrik),
W79-02361 5D

Purification of Effluents of the Verkhotursk Wood Chemical Plant in Storage Ponds (Ochistka stochnykh vod Verkhoturskogo Lesokhimicheskogo Zavoda v prudu-nakopitele),
W79-02372 5D

Nitrate Reduction by Denitrifying Bacteria in Single and Two Stage Continuous Flow Reactors,
W79-02406 5D

BIOMASS
Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

Soft-Shore Macrobenthos Along the South-West Coast of Wales,
W79-02240 5C

BIORHYTHMS
Role of Inorganic Ions in Controlling Sedimentation Rate of a Marine Centric Diatom Ditylum Brightwelli,
W79-02014 5C

BLANEY-CRIDDLE METHOD
Evapotranspiration Estimates for Water Right Transfers,
W79-02491 2D

BLEACHING WASTES
Possibility of Rendering Bleachery Effluents Harmless by Technological Changes (Ueber die

Moeglichkeit Bleichereiabwaesser durch technologische Aenderungen unschaedlich zu machen),
W79-02360 5G

Toxicity, BOD, and Color of Effluents from Novel Bleaching Processes,
W79-02374 5C

Desalination in the Reuse of Industrial Waste Water,
W79-02383 5D

BLIND ZONES
The Blind Zone in Seismic Ground-Water Exploration,
W79-02190 4B

BLUE-WINGED TEAL
Diurnal Use of Small Wetlands by Ducks,
W79-02418 2I

BOARD MILLS
Planning and Startup of a Flexible Activated Sludge Installation (Bioflex Process) as a Biological Clarification Stage in a Board Mill (Planung und Inbetriebnahme einer flexiblen Belebtschlammanlage (Bioflex-Verfahren) als biologische Klaerstufe einer Kartonfabrik),
W79-02361 5D

BOATING
Consumer Surplus and Economic Rent Estimates of Recreation Value: An Empirical and Theoretical Comparison,
W79-02290 6B

BOGS
Vegetation Changes in a Small Michigan Bog from 1917 to 1972,
W79-02091 2H

Water Level Fluctuation in a Northeastern Ontario Peatland,
W79-02105 2H

BOND ISSUES
Structuring Water Utility Bond Issues to Cope with Inflation,
W79-02024 6C

BOREHOLE CAMERA
The Downhole TV Camera Can 'See' What's Wrong,
W79-02178 8G

BOTTOM SEDIMENTS
Gradient, Discharge, and Particle-Size Relations of Alluvial Channels in Kansas, With Observations on Braiding,
W79-02120 2J

Trace Element of the Sardis Reservoir, Mississippi, as Related to Clay Mineral Dispersion,
W79-02187 2H

BOULDER (COLO)
Pollutional Characteristics of Stormwater Runoff,
W79-02451 5B

BOX CULVERTS
Strength and Behavior of Thick Waled Reinforced Concrete Conduits,
W79-02217 8F

Design and Proof Test Requirements for Precast Reinforced Concrete Box Culverts,
W79-02218 8F

BRAIDING
Subsurface Geological Investigation of a Pleistocene Braided Stream in the Northern Coastal Plain, Delaware (U.S.A.),
W79-02167 2J

BREAKWATERS
Tire Module Systems in Shore and Harbor Protection,
W79-02201 8G

BRITISH COLUMBIA (CANADA)
Natural Resources and Regional Disparities: A Skeptical View,
W79-02034 6B

BROWN SHRIMP
Uptake, Retention and Loss of Cadmium by Brown Shrimp, (Crangon Crangon),
W79-02463 5B

BROWN TROUT
Determination of Methylmercury in Fish of South Carolina,
W79-02478 5A

BULRUSHES
A Review of the Biology, Ecology, and Management of Scirpus Olneyi, Volume I: An Annotated Bibliography of Selected References,
W79-02110 2I

BURNING
Changes in Understory Vegetation in Cypress Domes Brought About by Fire and Addition of Sewage,
W79-02263 5C

BURNTSIDE LAKE (MN)
A Paleolimnological Comparison of Burntside and Shagawa Lakes, Northeastern Minnesota,
W79-02295 5C

CADMIUM
Uptake, Retention and Loss of Cadmium by Brown Shrimp, (Crangon Crangon),
W79-02463 5B

The Pollution of Sea-Water in Nagasaki Bay in Summer 1976 and 1977, (In Japanese),
W79-02482 5B

Microorganisms and Heavy metal Toxicity,
W79-02483 5C

CALCIUM
Zinc Nutrition of Rice as Influenced by Rates of Gypsum and Zn Fertilizaton of Alkali Soils,
W79-02099 3F

CALIFORNIA
The Economics of Water Conservation,
W79-02022 3D

Land Use and Rights in Groundwater. Case Note, Alameda County Water District v. Niles Sand and Gravel Co., 37 Cal.App. 3d 924, 112 Cal.Rptr. 846 (Ct.App. 1974), cert. denied, U.S. 95 S.Ct. 128 (1974),
W79-02085 6E

Making the Desert Flower: Irrigating California's Imperial Valley,
W79-02092 3F

The Occurrence and Removal of Nitrogen in Subsurface Agricultural Drainage from the San Joaquin Valley, California,
W79-02107 5G

Sedimentation in Hot Creek in Vicinity of Hot Creek Fish Hatchery, Mono County, California,
W79-02128 2J

Model Aids Planners in Predicting Rising Ground-Water Levels in San Bernadino, California,
W79-02173 4B

Liquefaction Potential of Hydraulic Fills,
W79-02203 8D

Ground Water...California's Priceless Resource,
W79-02392 4B

CANADA
Natural Resources and Regional Disparities: A Skeptical View,
W79-02034 6B

Econometric Analysis of Environmental Policy: Estimation of a Model of the Canadian Pulp and Paper Industry,
W79-02046 6B

The Origin of Labyrinth and Tower Karst and the Climatic Conditions Necessary for Their Development,
W79-02073 2F

Water Level Fluctuation in a Northeastern Ontario Peatland,
W79-02105 2H

Analysis of Error in the Determination of Snow Storage for Small High Arctic Basins,
W79-02197 2C

Seasonal Changes in the Epiphyte Community of Natural and Artificial Macrophytes in Lake Memphremagog (QUE. and VT.),
W79-02232 5C

Reaction Products and Solubility of Applied Zinc Compounds in Some Manitoba Soils,
W79-02362 2K

CANADA GOOSE
Earthquake-Initiated Changes in the Nesting Habitat of the Dusky Canada Goose,
W79-02416 2I

CANALS
Water Quality in the Old Plantation Water Control District, Broward County, Florida-Progress Report, July 1976-June 1977,
W79-02127 5B

CAPE COD (MA)
Potential Importance of Benthic Cysts of Gonyaulax Tamarensis and G. Excavata Initiating Toxic Dinoflagellate Blooms,
W79-02011 5C

CARBON
Photosynthetic Rates of Marine Algae as a Function of Inorganic Carbon Concentration,
W79-02224 5C

CARCINOGENS
Bioaccumulation Potential and Acute Toxicity of Synthetic Fuels Effluents in Freshwater Biota: Azaarenes,
W79-02241 5C

CAROTENOIDS
Specific Blue-Green Algal Carotenoids in Sediments of Esthwaite Water,
W79-02246 5C

CARP
Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

Influence of Silver Carp (Hypophtalmichthys Molitrix) on Plankton of Shallow Waters According to Investigations in Carp Ponds (Wirkungen Von Silberkarpfen (Hypophthalmichtmys Molitrix) Auf Das Plankton in Flachcewassern Nach Untersuchungen in Karpfenteichen),
W79-02457 5C

Blood Corpuscle Resistance of Carp Died of Environmental Hypoxia and of Cyanide Poisoning, (In Japanese),
W79-02471 5C

CASPIAN SEA
Mechanism of Formation and Forecast of the Development of the Volga Delta,
W79-02210 2J

CATFISH
Thermal Tolerance and Preference of the Indian Catfish Heteropneustes Fossilis,
W79-02455 5C

CATFISH ELECTROCARDIOGRAMS
New Method for Recording Heart and Respiratory Rates in Catfish,
W79-02077 7B

CATION ADSORPTION
Application of the Electrical Double Layer Theory to Predict Ion Absorption in Mixed Ionic Systems,
W79-02314 2K

CATIONS
Ammonium Effects on Nutrient Cation Absorption by Wheat,
W79-02021 3F

CATTLE
Range Cattle Impacts on Stream Water Quality in the Colorado Front Range,
W79-02386 5G

CAYUGA LAKE (NY)
Is It Time to Do a Benefit-Cost Analysis for the Location of a Power Plant,
W79-02054 6B

CELL QUOTA
Dependence of Light-Saturated Rates of Algal Photosynthesis on Intracellular Concentrations of Phosphorus,
W79-02236 5C

Kinetics of Algal Transient Phosphate Uptake and the Cell Quota Concept,
W79-02237 5C

CENTRAL U.S.
Drought in the Upper Midwest, 1931-1969,
W79-02196 2B

CHAIN OF ROCKS CANAL (MO-ILL)
Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation,
W79-02354 8B

CHANNEL CATFISH
New Method for Recording Heart and Respiratory Rates in Catfish,
W79-02077 7B

CHANNEL IMPROVEMENT
Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation,
W79-02354 8B

CHANNEL MORPHOLOGY
Subsurface Geological Investigation of a Pleistocene Braided Stream in the Northern Coastal Plain, Delaware (U.S.A.),
W79-02167 2J

CHELATING AGENTS
Measurement of Chelating Agent Levels in Media with High Concentrations of Interfering Metal Ions,
W79-02079 5A

CHELATION
Measurement of Chelating Agent Levels in Media with High Concentrations of Interfering Metal Ions,
W79-02079 5A

CHEMCONTROL
Chemical Foam Control During Effluent Treatment in Aeration Tanks (Khimicheskoe penogashenie pri ochistke stochnykh vod v aerotenkakh),
W79-02382 5D

CHEMICAL ANALYSIS
Origins of Water and Solutes in the Geopressured Zones of the Northern Gulf of Mexico Basin,
W79-02131 2K

Chemical Quality of Ground Water in Fairfax County, Virginia,
W79-02133 7C

Partial Characterization of Chlorinated Organics in Superchlorinated Septages and Mixed Sludges,
W79-02413 5D

A Statistical Evaluation of Some Columbia River Basalt Chemical Analysis,
W79-02433 5A

CHEMICAL OXYGEN DEMAND
Possibilities for Reducing COD and 5-Day BOD in Waste Waters from the Pulp and Viscose Rayon Fiber Industries (Moeglichkeiten zur Reduktion des CSB und BSB(5) in den Abwaessern der Zellstoff- und Viskosefaserindustrie),
W79-02376 5D

The Pollution of Sea-Water in Nagasaki Bay in Summer 1976 and 1977, (In Japanese),
W79-02482 5B

CHEMICAL PRECIPITATION
Redox Potential Measurements as an Indication of Biochemical Well Plugging,
W79-02170 5A

Method of Treating a Waste Liquid Containing Polluting Compounds,
W79-02324 5D

CHEMICAL PROPERTIES
Hula Valley Peat: Review of Chemical and Geochemical Aspects,
W79-02365 2K

CHEMICAL REACTIONS
Waste Fluid Treatment System,
W79-02343 5D

CHILE
Water Utilization and Reallocation in Chile: A Study of the Pirque Valley,
W79-02053 6B

CHLORELLA
Effect of Hexachlorobenzene (HCB) on Photosynthetic Oxygen Evolution and Respiration of Chlorella Pyrenoidosa,
W79-02480 5C

CHLORINATED HYDROCARBON PESTICIDES
Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

Further Data on Heavy Metals and Organochlorines in Marine Mammals from German Coastal Waters,
W79-02460 5B

Insecticide Persistence in Natural Seawater as Affected by Salinity, Temperature, and Sterility,
W79-02487 5B

CHLORINATION
Partial Characterization of Chlorinated Organics in Superchlorinated Septages and Mixed Sludges,
W79-02413 5D

CHLORINE
Comparison of Methods for the Determination of Total Available Residual Chlorine in Various Sample Matrices,
W79-02412 5A

CHLOROPHYLL
Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships of Lakes,
W79-02247 5C

Distribution of Chlorophyll in Cypress Ecosystems,
W79-02278 2I

CHRISTIANSEN'S UNIFORMITY COEFFICIENT
Lawn Sprinkler Distribution Patterns,
W79-02155 3F

CHROMATOGRAPHY
Atomic Absorption Detector for Chromium Organometallic Compounds Separated by High Speed Liquid Chromatography,
W79-02080 5A

CHROMIUM COMPOUNDS
Atomic Absorption Detector for Chromium Organometallic Compounds Separated by High Speed Liquid Chromatography,
W79-02080 5A

CICHLIDS
Effect of Methallibure on the Hypophysis and Gonadal Development of the Cichlid Fish, Tilapia Mossambica,
W79-02477 5C

CLAMS
Effects of Thermal Discharges on Mortality of Mercenaria Mercenaria in Barnegat Bay, New Jersey,
W79-02473 5C

CLARK COUNTY (SD)
Major Aquifers in Clark County, South Dakota,
W79-02134 2F

CLASSIFICATION
Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

Identification and Delineation of Freshwater Wetland Values,
W79-02402 6B

CLAY MINERALS
Trace Element of the Sardis Reservoir, Mississippi, as Related to Clay Mineral Dispersion,
W79-02187 2H

Effects of Temperature and Time on Hydroxy Aluminum Phosphate-Montmorillonite Complex,
W79-02436 2G

CLEANING
Drive Device for Rake Arm with Attached Screen Comb in Cleaning Device for a Water Conduit Screen,
W79-02306 8C

CLEAR LAKE (CA)
A Pattern Analysis of Clear Lake Phytoplankton,
W79-02227 5C

CLIMATES
The Origin of Labyrinth and Tower Karst and the Climatic Conditions Necessary for Their Development,
W79-02073 2F

Radiation Studies: Cypress Wetlands,
W79-02261 2I

CLIMATOLOGY
Drought in the Upper Midwest, 1931-1969,
W79-02196 2B

CLOGGING
Redox Potential Measurements as an Indication of Biochemical Well Plugging,
W79-02170 5A

CLUB OF ROME
A Polluted Golden Age,
W79-02071 5G

COAGULATION
Method for Treating a Medium Containing Water with Coagulants,
W79-02322 5D

COAL MINE WASTES
Source Assessment: Water Pollutants From Coal Storage Areas,
W79-02144 5B

COAL MINES
Acid Mine Drainage and Subsidence: Effects of Increased Coal Utilization,
W79-02409 5G

COASTAL MARSHES
Food Habits of Coastal Marsh Raccoons with Observations of Alligator Nest Predation,
W79-02117 2L

Effect of Dissolved Oxygen and Redox Potential and Nitrate Removal in Flooded Swamp and Marsh Soils,
W79-02426 5C

COASTAL PLAINS
Subsurface Geological Investigation of a Pleistocene Braided Stream in the Northern Coastal Plain, Delaware (U.S.A.),
W79-02167 2J

COASTAL ZONE MANAGEMENT
Proceedings of the Interstate Seafood Seminar October 4-7, 1977.
W79-02163 5G

COASTS
You Can Tailor Effluent BOD to Fit the Receiving-Water Ecosystem...and Enhance the Environment. Urban and Fish-Processing Wastes in the Marine Environment: Bioenhancement Studies at Terminal Island, California,
W79-02164 5E

The Urquiola Oil Spill, La Coruna, Spain: Impact and Reaction on Beaches and Rocky Coasts,
W79-02500 5C

COD
Organchlorines in Codfish from Harbours Along the Norwegian Coast,
W79-02479 5C

COLD REGIONS
Research on Control Technology for Ice Fog From Mobile Sources,
W79-02147 5G

COLD WEATHER CONSTRUCTION
Construction and Operation of Low-Pressure Dams on Permafrost Soils,
W79-02220 8D

COLOR
Toxicity, BOD, and Color of Effluents from Novel Bleaching Processes,
W79-02374 5C

COLORADO
Disaster Response to Flash Flood,
W79-02193 8B

Structural Control of the Rapids and Pools of the Colorado River in the Grand Canyon,
W79-02200 2E

Range Cattle Impacts on Stream Water Quality in the Colorado Front Range,
W79-02386 5G

COLORADO RIVER
Structural Control of the Rapids and Pools of the Colorado River in the Grand Canyon,
W79-02200 2E

A Systematic Procedure for Taxing Agricultural Pollution Sources,
W79-02219 5G

COLORIMETRY
Systematic Absorbance Errors with Technicon AutoAnalyzer II Colorimeters,
W79-02074 2K

COLUMBIA RIVER BASIN
A Statistical Evaluation of Some Columbia River Basalt Chemical Analysis,
W79-02433 5A

COMBINED SEWERS
Handling and Disposal of Sludges from Combined Sewer Overflow Treatment. Phase II - Impact Assessment,
W79-02303 5D

COMMERCIAL FISHING
A Note on the Welfare-Economic Consequences of Extended Fishing Limits,
W79-02047 6E

'The Relationship Between Firm and Fishery in Common Property Fisheries': Comment,
W79-02060 6B

'The Relationship Between Firm and Fishery in Common Property Fisheries': Reply,
W79-02061 6B

Dynamic Analysis of Commercial Fishing Model,
W79-02063 6C

Optimal Utilization and the Control of Fisheries,
W79-02065 6B

Optimization and Suboptimization in Fishery Regulation,
W79-02066 6B

Optimization and Suboptimization in Fishery Regulation: Comment,
W79-02067 6B

Mathematical Models of a Fishery,
W79-02069 6B

Exploitation of Common-Property Replenishable Natural Resources,
W79-02070 6B

COMMERCIAL SHELLFISH
Possible Toxic Effects of the Marine Blue-Green Alga, Spirulina Subsalsa, on the Blue Shrimp, Penaeus Stylirostris,
W79-02459 5C

Uptake, Retention and Loss of Cadmium by Brown Shrimp, (Crangon Crangon),
W79-02463 5B

COMMON PROPERTY
Exploitation of Common-Property Replenishable Natural Resources,
W79-02070 6B

COMMUNITIES
Do Tides Affect Coastal Insect Communities,
W79-02089 2L

COMPETITION
Optimal and Competitive Use of Replenishable Natural Resources by Open Economies.
W79-02058 6C

COMPUTER MODELS
Organism Patchiness in Lakes Resulting from the Interaction Between the Internal Seiche and Planktonic Diurnal Vertical Migration,
W79-02009 5C

A Simulation Model for Resource Policy Evaluation,
W79-02025 6A

A Computer Simulation of Phosphate and Nitrogen Transport by Water Runoff,
W79-02251 5B

CONDUITS
Strength and Behavior of Thick Waled Reinforced Concrete Conduits,
W79-02217 8F

CONFINED WATER
Potential for Downward Leakage to the Floridan Aquifer, Green Swamp Area, Central Florida,
W79-02136 7C

CONJUNCTIVE USE
Innovative Water System Solves Quality Problem,
W79-02183 5G

Development of a Stream-Aquifer Model Suited for Management,
W79-02450 4B

CONNECTICUT
Biochemical and Transpiration Studies of the Growth Form of Spartina Alterniflora on Connecticut Salt Marshes,
W79-02101 2I

CONSTRUCTION COSTS
EPA's Construction Grants Program: Perspectives Costs,
W79-02027 5G

CONSTRUCTION GRANT PROGRAM
EPA's Construction Grants Program: Perspectives Costs,
W79-02027 5G

CONSUMER SURPLUS
Consumer Surplus and Economic Rent Estimates of Recreation Value: An Empirical and Theoretical Comparison,
W79-02290 6B

CONTINENTAL SLOPE
The Distribution and Form of Phosphorus in North Atlantic Ocean Deep-Sea and Continental Slope Sediments,
W79-02230 5B

CONVEYANCE STRUCTURES
A Hydraulic Installation in the Water Supply System of Emmaus-Nicopolis,
W79-02394 4A

COOLING PONDS
Optimal Configuration of the Cooling System for Power Generation,
W79-02081 5G

COOLING TOWERS
Optimal Configuration of the Cooling System for Power Generation,
W79-02081 5G

COOLING WATER
Ecological Effects of Cooling Water of a Power Plant at Kiel Fjord,
W79-02461 5C

COPALIS BEACH (WA)
Blooms of Surf-Zone Diatoms Along the Coast of the Olympic Peninsula, Washington, IX. Factors Controlling the Seasonal Cycle of Nitrate in the Surf at Copalis Beach (1971 through 1975),
W79-02244 5C

COPPER
New Membranes for Treating Metal Finishing Effluents by Reverse Osmosis,
W79-02300 5D

COPPER SULFATE
Copper Sulfate Helps Control Micorganisms in Reservoirs,
W79-02018 5F

CORAL
The Uptake, Retention, and Release of Ammonium by Reef Corals,
W79-02228 5C

CORES
The Organic Sediments of Corkscrew Swamp Sanctuary,
W79-02284 2H

CORRELATIVE RIGHTS DOCTRINE
Land Use and Rights in Groundwater. Case Note, Alameda County Water District v. Niles Sand and Gravel Co., 37 Cal.App. 3d 924, 112 Cal.Rptr. 846 (Ct.App. 1974), cert. denied, U.S. 95 S.Ct. 128 (1974),
W79-02085 6E

COST ANALYSIS
The Projected Cost of Cypress Wetland Disposal for Waldo, Florida,
W79-02286 5E

Economic Impact of Alternative Stormwater Drainage Systems,
W79-02289 5D

Assessment of Hazardous Waste Practices in the Petroleum Refining Industry,
W79-02440 5D

COST-BENEFIT ANALYSIS
Measurement of Economic Uncertainty in Public Water Resource Development: An Extension,
W79-02050 6B

Studying the Economics of a Waterway: A Critique of Studies of the McClellan-Kerr Arkansas River Navigation System,
W79-02052 6B

Is It Time to Do a Benefit-Cost Analysis for the Location of a Power Plant,
W79-02054 6B

An Economic Approach to Water Supply Planning in Southeastern Virginia,
W79-02294 6B

COSTS
The Economics of Water Conservation,
W79-02022 3D

Financing System Changes,
W79-02023 6C

An Analysis of Network Costs: A Study of Sydney's Water Supply from 1890 to 2001, Part I: Research Methods,
W79-02033 6B

Econometric Analysis of Environmental Policy: Estimation of a Model of the Canadian Pulp and Paper Industry,
W79-02046 6B

Natural Resources and Environmental Restrictions to Growth,
W79-02056 6G

Calculating the Cost of Each Irrigation,
W79-02094 3F

Tire Module Systems in Shore and Harbor Protection,
W79-02201 8G

CRABS
Effects of Burial on the Heart Cockle Clinocardium Nuttallii and the Dungeness Crab Cancer Magister,
W79-02472 5C

CROP PRODUCTION
Growth and Yield of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02035 3F

Plant Water Relationships of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02043 3F

Tillage Effects on Winter Wheat Production Where the Irrigated and Dryland Crops are Alternated,
W79-02088 3F

Making the Desert Flower: Irrigating California's Imperial Valley,
W79-02092 3F

Best Management Practices to Control Nonpoint-Source Pollution from Agriculture,
W79-02233 5G

CROP RESPONSE
Sugar Cane Growth in Response to Mulch and Fertilizer on Saline-Alkali Subsoils,
W79-02029 3C

Yield Response to Soil Warming: Agronomic Crops,
W79-02490 3F

CROP WATER REQUIREMENTS
Advection Modification of the Priestley and Taylor Evapotranspiration Formula,
W79-02395 2D

CRUDE OIL
Net-And Nanoplankton: Effects of an Oil Spill in the North Sea,
W79-02467 5C

The Urquiola Oil Spill, La Coruna, Spain: Impact and Reaction on Beaches and Rocky Coasts,
W79-02500 5C

CRUSTACEANS
The Crustacean Zooplankton of Grasmere Before and After a Change in Sewage Effluent Treatment,
W79-02458 5C

CRYPTOMONAS OVATA
Simulation Model of Cryptomonas Ovata Population Dynamics in Southern Kootenay Lake, British Columbia,
W79-02225 5C

CUB RUN BASIN (VA)
Flood-Plain Delineation for Cub Run Basin, Fairfax County, Virginia,
W79-02137 2E

CULTIVATION
Tillage Effects on Winter Wheat Production Where the Irrigated and Dryland Crops are Alternated,
W79-02088 3F

CULVERTS
Strength and Behavior of Thick Waled Reinforced Concrete Conduits,
W79-02217 8F

Design and Proof Test Requirements for Precast Reinforced Concrete Box Culverts,
W79-02218 8F

CYANIDE
Ozone Treatment of Cyanide-Bearing Plating Waste,
W79-02299 5D

Blood Corpuscle Resistance of Carp Died of Environmental Hypoxia and of Cyanide Poisoning, (In Japanese),
W79-02471 5C

CYANIDES
Waste Fluid Treatment System,
W79-02343 5D

CYANOPHYTA
The Characterization of Bacillus Capable of Blue-Green Bactericidal Activity,
W79-02159 5D

Specific Blue-Green Algal Carotenoids in Sediments of Esthwaite Water,
W79-02246 5C

Possible Toxic Effects of the Marine Blue-Green Alga, Spirulina Subsalsa, on the Blue Shrimp, Penaeus Stylirostris,
W79-02459 5C

CYCLING NUTRIENTS
A Simulation Model for Phytoplankton Growth and Nutrient Cycling in Eutrophic, Shallow Lakes,
W79-02008 5C

A Budget of Nitrogen Recycling in North Sea Sediments off the Belgian Coast,
W79-02245 5C

The Release of Plant Nutrients from Reed Borders and its Transport into the Open Waters of the Bodensee-Untersee, (In German),
W79-02422 5C

CYTOCHROME P450
The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

CYTOLOGICAL STUDIES
Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

Effect of Methallibure on the Hypophysis and Gonadal Development of the Cichlid Fish, Tilapia Mossambica,
W79-02477 5C

DALLAS (TX)
Financing System Changes,
W79-02023 6C

DAMAGES
Wetland Road Crossing: Drainage Problems and Timber Damage,
W79-02421 4C

DAMS
Construction and Operation of Low-Pressure Dams on Permafrost Soils,
W79-02220 8D

DAPHNIA PULEX
Release of Dissolved Organic Carbon by Grazing Zooplankton,
W79-02234 5C

Bioaccumulation Potential and Acute Toxicity of Synthetic Fuels Effluents in Freshwater Biota: Azaarenes,
W79-02241 5C

DATA COLLECTIONS
Hazardous Material Spills: A Documentation and Analysis of Historical Data,
W79-02411 5G

DATA STORAGE AND RETRIEVAL
Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W79-02123 10D

DATING
An Evaluation of Isotope Concentrations in the Ground Water of Saudi Arabia,
W79-02254 2F

DDT
Wastewater Treatment Technology Documentation for DDT Manufacture,
W79-02444 5D

A Method of Predicting the Biological Effects of Synthetic Pollutants in the North Sea,
W79-02470 5C

Organchlorines in Codfish from Harbours Along the Norwegian Coast,
W79-02479 5C

DECISION MAKING
Quantification, Decision-Making and Environmental Impact Assessment in the United Kingdom.
W79-02028 6G

Issues in Water Development Decisions: A Discussion Paper,
W79-02042 6B

Planning and Modeling in Urban Water Management,
W79-02288 6B

Nine Fallacies of Natural Disaster: The Case of the Sahel,
W79-02398 6B

DECOMPOSING ORGANIC MATTER
Model for Decomposition of Organic Material by Microorganisms,
W79-02415 2G

DEEP WATER
The Distribution and Form of Phosphorus in North Atlantic Ocean Deep-Sea and Continental Slope Sediments,
W79-02230 5B

DELAWARE
Subsurface Geological Investigation of a Pleistocene Braided Stream in the Northern Coastal Plain, Delaware (U.S.A.),
W79-02167 2J

DELAWARE BAY
Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay,
W79-02223 5C

DELTAS
Mechanism of Formation and Forecast of the Development of the Volga Delta,
W79-02210 2J

Seiches in the Baltic Sea and Their Effect on Floods in the Neva River Delta,
W79-02213 2L

DENITRIFICATION
Nitrogen Transformations in Water and Sediments of Cypress Domes with and without Added Sewage Effluent,
W79-02276 2H

Reduction of Nitrate in a Soil Column During Continuous Flow,
W79-02366 2G

Nitrate Reduction by Denitrifying Bacteria in Single and Two Stage Continuous Flow Reactors,
W79-02406 5D

DENITRIFYING BACTERIA
Nitrate Reduction by Denitrifying Bacteria in Single and Two Stage Continuous Flow Reactors,
W79-02406 5D

DENMARK
Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-02103 5C

DEPTH
Maximum Depth Inhabited by Aquatic Vascular Plants,
W79-02249 5C

DEPURATION
Uptake, Retention and Loss of Cadmium by Brown Shrimp, (Crangon Crangon),
W79-02463 5B

DESALINATION
Desalination Reverse Osmotic Membranes and Their Preparation,
W79-02338 3A

DESERTIC TERMINAL LAKES
Stochastic Modeling for Predicting Frequency Distribution of Stages in Thermal Lakes at Future Planning Horizons,
W79-02495 4A

DESERTIFICATION
Remote Sensing Techniques and the Monitoring of Desertification Processes in Arid Areas,
W79-02390 7B

DESIGN
Practical Riprap Design,
W79-02351 8B

DESIGN CRITERIA
Practical Riprap Design,
W79-02351 8B

DETENTION RESERVOIRS
Economic Impact of Alternative Stormwater Drainage Systems,
W79-02289 5D

DETENTION STORAGE
Economic Impact of Alternative Stormwater Drainage Systems,
W79-02289 5D

DETOXIFICATION
Microorganisms and Heavy metal Toxicity,
W79-02483 5C

DETRITUS
Amino Acids in Salt Marsh Detritus,
W79-02086 5C

DEWATERING
Economic Evaluation of Four Sludge Dewatering Devices,
W79-02037 5D

Investigations of Heat Treatment for Paper Mill Sludge Conditioning,
W79-02296 5E

Perimeter Dike Raising with Dewatered Fine-Grained Dredged Material at Upper Polecat Bay Disposal Area, Mobile, Alabama,
W79-02345 5E

DIATOMS
Role of Inorganic Ions in Controlling Sedimentation Rate of a Marine Centric Diatom Ditylum Brightwelli,
W79-02014 5C

The Role of Silica and the Vernal Diatom Bloom in Controlling the Growth of Nuisance Algal Populations in Lakes,
W79-02152 5C

Blooms of Surf-Zone Diatoms Along the Coast of the Olympic Peninsula, Washington, IX. Factors Controlling the Seasonal Cycle of Nitrate in the Surf at Copalis Beach (1971 through 1975),
W79-02244 5C

Growth-Influencing Substances in Sediment Extracts from a Subtropical Wetland: Investigation Using a Diatom Bioassay,
W79-02476 5C

Differential Elimination of Phenol by Diatoms and Other Unicellular Algae from Low Concentrations,
W79-02486 5C

DIAZINON
Insecticide Persistence in Natural Seawater as Affected by Salinity, Temperature, and Sterility,
W79-02487 5B

DIEL MIGRATION
Organism Patchiness in Lakes Resulting from the Interaction Between the Internal Seiche and Planktonic Diurnal Vertical Migration,
W79-02009 5C

Role of Inorganic Ions in Controlling Sedimentation Rate of a Marine Centric Diatom Ditylum Brightwelli,
W79-02014 5C

DIETS
Effects of Some Environmental Factors on Growth and Food Consumption of the Baltic Palaemonid Shrimp, Palaemon Adspersus Var. Fabricii (Rathke),
W79-02465 5C

DIFFERENTIAL THERMAL ANALYSIS
Supercooling of Water to -92 Degrees C Under Pressure,
W79-02494 2C

DIKES
Perimeter Dike Raising with Dewatered Fine-Grained Dredged Material at Upper Polecat Bay Disposal Area, Mobile, Alabama,
W79-02345 5E

DIPTERA
Progress Repot on Mosquitoe Research: Cypress Domes,
W79-02281 5G

DIRECTORIES
Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W79-02123 10D

DISASTERS
Disaster Response to Flash Flood,
W79-02193 8B

Nine Fallacies of Natural Disaster: The Case of the Sahel,
W79-02398 6B

DISCHARGE COEFFICIENT
Hydraulic Model Tests of the Proposed Weir for the Richelieu River at St. Jean, Quebec,
W79-02414 8C

DISCHARGE (WATER)
Ecological Effects of Cooling Water of a Power Plant at Kiel Fjord,
W79-02461 5C

DISPERSION
Wind Induced Dispersion and Algal Growth in Shallow Lakes,
W79-02226 5G

Compositions and Processes for the Dispersing of Oil Spillages,
W79-02325 5G

DISSOLVED ORGANIC CARBON
Release of Dissolved Organic Carbon by Grazing Zooplankton,
W79-02234 5C

DISSOLVED OXYGEN
Significance of Nitrification in Stream Analysis-Effects on the Oxygen Balance,
W79-02001 5C

Oxygen Transfer at Hydraulic Structures,
W79-02202 5G

Effect of Dissolved Oxygen and Redox Potential and Nitrate Removal in Flooded Swamp and Marsh Soils,
W79-02426 5C

DISSOLVED SOLIDS
The Uptake of Dissolved Organic Matter by a Small Spring Stream,
W79-02248 5C

Particulate and Dissolved Organic Matter in a Small Partly Forested Ontario Stream,
W79-02252 5C

DISTILLATION
Home Water Distiller,
W79-02319 5F

DISTRIBUTION
The Distribution of Juncus Roemerianus in the Salt Marshes of North America,
W79-02093 2L

DISTRIBUTION PATTERNS
An Atlas of Vascular Plant Species Distribution Maps for Tidewater maryland,
W79-02109 2I

Lawn Sprinkler Distribution Patterns,
W79-02155 3F

Trace Element of the Sardis Reservoir, Mississippi, as Related to Clay Mineral Dispersion,
W79-02187 2H

The Response of Benthic Invertebrate Populations to Sewage Addition,
W79-02267 5C

Wind, Sprinkler Patterns, and System Design,
W79-02368 3F

Earthquake-Initiated Changes in the Nesting Habitat of the Dusky Canada Goose,
W79-02416 2I

DITYLUM BRIGHTWELLI
Role of Inorganic Ions in Controlling Sedimentation Rate of a Marine Centric Diatom Ditylum Brightwelli,
W79-02014 5C

DNIESTER RIVER (USSR)
Study of River Meandering in the Search for Tectonic Structures (As Exemplified by the Middle Dniester Region),
W79-02205 8E

DOCUMENTATION
Hazardous Material Spills: A Documentation and Analysis of Historical Data,
W79-02411 5G

DOMESTIC WATER
Urban Water: Access, Delivery and Institutional Scarcity,
W79-02036 6E

DOSIMETRY
Proceedings of a Workshop on the Evaluation of Models Used for the Environmental Assessment of Radionuclide Releases.
W79-02434 5B

DRAINAGE
The Occurrence and Removal of Nitrogen in Subsurface Agricultural Drainage from the San Joaquin Valley, California,
W79-02107 5G

DRAINAGE DEVICES
Drainage Device for Particulate Material,
W79-02326 5D

DRAINAGE EFFECTS
The Occurrence and Removal of Nitrogen in Subsurface Agricultural Drainage from the San Joaquin Valley, California,
W79-02107 5G

Source Assessment: Water Pollutants From Coal Storage Areas,
W79-02144 5B

Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands: Soil Relationships,
W79-02429 6G

DRAINAGE MAPS
Drainage Map of Arizona Showing Perennial Streams and Some Important Wetlands,
W79-02121 7C

DRAINAGE SYSTEMS
Economic Impact of Alternative Stormwater Drainage Systems,
W79-02289 5D

DRAWDOWN
Transient Spherical Flow to a Nonpenetrating Well with Constant Drawdown,
W79-02191 4B

The Effect of Drawdown Date on Wetland Plant Succession,
W79-02424 2I

DREDGE SPOIL DISPOSAL
Dredge Spoil in Mississippi Sound,
W79-02188 5E

DREDGED MATERIAL
Perimeter Dike Raising with Dewatered Fine-Grained Dredged Material at Upper Polecat Bay Disposal Area, Mobile, Alabama,
W79-02345 5E

DREDGED MATERIAL DISPOSAL
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix A: Planktonic Communities, Benthic Assemblages, and Fishery,
W79-02346 5E

Ability of Salt Marshes to Remove Nutrients and Heavy Metals from Dredged Material Disposa Area Effluents,
W79-02347 5E

Flume Experiments on Sand, Silt, and Clay Mixtures from the Offshore Dredged Material Disposal Site, Galveston, Texas,
W79-02348 5E

Aquatic Disposal Field Investigations Duwamish Waterway Disposal Site Puget Sound, Washington, Evaluative Summary,
W79-02350 5C

DREDGING
Environmental Impact Assessment: An Aquatic Biologist's Point of View,
W79-02222 6G

Effects of Burial on the Heart Cockle Clinocardium Nuttallii and the Dungeness Crab Cancer Magister,
W79-02472 5C

The Effect of Silt-Fence on the Prevention of Sea Water Siltation Caused by Dredging and Reclaiming Work in Harbor, (In Japanese),
W79-02481 5C

DRILLING
The Controversy Continues: State Ownership of Drill Rigs,
W79-02168 6E

Two Drilling Methods Compared,
W79-02169 8B

DRILLING FLUIDS
Effect of Barite (BASO4) on Development of Estuarine Communities,
W79-02484 5C

DRIP IRRIGATION
Drip Study Shows up to 30% Water Savings,
W79-02090 3F

DROUGHT
Yield of Dryland Grain Sorghum as Affected by Antitranspirant, Nitrogen, and Contributing Micro-Watershed,
W79-02403 3F

DROUGHT RESISTANCE
Design and the Desert Environment: Landscape Architecture in the American Southwest,
W79-02389 3B

DROUGHT-TOLERANCE
Design and the Desert Environment: Landscape Architecture in the American Southwest,
W79-02389 3B

DROUGHTS
The Economics of Water Conservation,
W79-02022 3D

Drought in the Upper Midwest, 1931-1969,
W79-02196 2B

Nine Fallacies of Natural Disaster: The Case of the Sahel,
W79-02398 6B

DRYING
Experience with Drum Dryers for Activated Sludge (Opyt naladki barabannykh sushilok aktivnogo ila),
W79-02385 5E

DUAL-ENERGY BEAMS
Material Content of Binary Physical Mixture as Measured with a Dual-Energy Beam of Gamma Rays,
W79-02356 2G

DUAL MEDIA FILTERS
Bark as a Medium for Gravity Dewatering of Secondary Sludge from Pulp and Paper Mills,
W79-02186 5D

DUAL SYSTEMS
Dual Water Supplies: An Idea for the Future,
W79-02175 3D

DUCKS
Diurnal Use of Small Wetlands by Ducks,
W79-02418 2I

DUWAMISH WATERWAY (WASH)
Aquatic Disposal Field Investigations Duwamish Waterway Disposal Site Puget Sound, Washington, Evaluative Summary,
W79-02350 5C

DYNAMIC MODELS
Coordinating Public Utility Expansion, Industrial Siting and Pollution Control: A Working Dynamic Programming Algorithm,
W79-02039 5G

Dynamic Analysis of Commercial Fishing Model,
W79-02063 6C

EARTH DAMS
Construction and Operation of Low-Pressure Dams on Permafrost Soils,
W79-02220 8D

EARTHQUAKES
Earthquake-Initiated Changes in the Nesting Habitat of the Dusky Canada Goose,
W79-02416 2I

EAST BAY MUNICIPAL UTILITY DISTRICT (CA)
The Economics of Water Conservation,
W79-02022 3D

EASTERN WASHINGTON
Water Resources Data for Washington, Water year 1977--Volume 2. Eastern Washington.
W79-02139 7C

ECONOMETRICS
Econometric Analysis of Environmental Policy: Estimation of a Model of the Canadian Pulp and Paper Industry,
W79-02046 6B

ECONOMIC DEVELOPMENT
Natural Resources and Regional Disparities: A Skeptical View,
W79-02034 6B

ECONOMIC EFFICIENCY
Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

ECONOMIC GROWTH
Growth and Optimal Growth with Renewable and Non Renewable Natural Resources,
W79-02032 6A

A Polluted Golden Age,
W79-02071 5G

ECONOMIC IMPACT
Econometric Analysis of Environmental Policy: Estimation of a Model of the Canadian Pulp and Paper Industry,
W79-02046 6B

The Economic Consequences of the 200-Mile Seabed Zone: The Replenishable Resources Case,
W79-02048 6E

'The Relationship Between Firm and Fishery in Common Property Fisheries': Comment,
W79-02060 6B

'The Relationship Between Firm and Fishery in Common Property Fisheries': Reply,
W79-02061 6B

ECONOMIC RENT
Consumer Surplus and Economic Rent Estimates of Recreation Value: An Empirical and Theoretical Comparison,
W79-02290 6B

ECONOMICS
The Economics of Water Conservation,
W79-02022 3D

The Long-Run Movement of the Prices of Exhaustible Resources,
W79-02026 6C

An Analysis of Network Costs: A Study of Sydney's Water Supply from 1890 to 2001, Part I: Research Methods,
W79-02033 6B

The Limited Applicability of Marshallian Economics to the Problem of Pollution Abatement: A Suggested Alternative,
W79-02041 5G

The Price of Natural Resources,
W79-02045 6C

A Note on the Welfare-Economic Consequences of Extended Fishing Limits,
W79-02047 6E

Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

Optimal and Competitive Use of Replenishable Natural Resources by Open Economies.
W79-02058 6C

'The Relationship Between Firm and Fishery in Common Property Fisheries': Comment,
W79-02060 6B

'The Relationship Between Firm and Fishery in Common Property Fisheries': Reply,
W79-02061 6B

Some Extensions of the Economic Theory of Exhaustible Resources,
W79-02064 6B

Optimization and Suboptimization in Fishery Regulation,
W79-02066 6B

Optimization and Suboptimization in Fishery Regulation: Comment,
W79-02067 6B

General Equilibrium with a Replenishable Natural Resource,
W79-02068 6B

Mathematical Models of a Fishery,
W79-02069 6B

Exploitation of Common-Property Replenishable Natural Resources,
W79-02070 6B

A Polluted Golden Age,
W79-02071 5G

Economics of Wilderness Resources,
W79-02072 6B

Consumer Surplus and Economic Rent Estimates of Recreation Value: An Empirical and Theoretical Comparison,
W79-02290 6B

ECOSYSTEMS
You Can Tailor Effluent BOD to Fit the Receiving-Water Ecosystem...and Enhance the Environment. Urban and Fish-Processing Wastes in the Marine Environment: Bioenhancement Studies at Terminal Island, California,
W79-02164 5E

EDDIES
Surface Drifter Movements Observed in Port Angeles Harbor and Vicinity, April 1978,
W79-02221 2L

EELGRASS
Distribution of Surficial Sediments and Eelgrass in New York's South Shore Bays: An Assessment from the Literature,
W79-02162 2L

EFFLUENTS
Source Assessment: Water Pollutants From Coal Storage Areas,
W79-02144 5B

Ability of Salt Marshes to Remove Nutrients and Heavy Metals from Dredged Material Disposa Area Effluents,
W79-02347 5E

EGGS
Effects of Simulated Flooding on Alligator Eggs,
W79-02116 2L

ELECTRICAL POTENTIAL DIFFERENCE
Streaming-Potential Effects in Saturated Water Flow Through a Sand-Kaolinite Mixture,
W79-02160 2G

Electrical Potentials During Water Entry into an Air-Dry Mixture of Sand and Kaolinite,
W79-02357 2G

ELECTROCHEMISTRY
Ion Mobilities in Pure Water Vapour at Saturation,
W79-02076 1B

Purification of Kraft Pulping Effluents by Electrochemical Oxidation (Ochistka stokov sul'fatno-tsellyuloznogo proizvodstva elektrokhimicheskim okisleniem),
W79-02380 5D

ELECTRODIALYSIS
Desalination in the Reuse of Industrial Waste Water,
W79-02383 5D

ELECTRON MICROSCOPY
Investigation of the Microflora of Swamp Ore and Lake Water by the Method of Electron Microscopy, (In German),
W79-02423 5A

ELECTRONIC EQUIPMENT
Ozone Treatment of Cyanide-Bearing Plating Waste,
W79-02299 5D

EMERGENCIES
Disaster Response to Flash Flood,
W79-02193 8B

EMPLOYMENT
The Need for Professionalism and its Attributes in Hydrogeology,
W79-02174 6E

ENVIRONMENTA EFFECTS
Effects of Forest Workings on Streamflow and Water Quality (Part I),
W79-02005 5C

ENVIRONMENTAL CONTROL
Survey of Environmental Regulations Applying to Geothermal Exploration, Development, and Use,
W79-02410 5G

ENVIRONMENTAL ECONOMICS
Economics of Wilderness Resources,
W79-02072 6B

ENVIRONMENTAL EFFECTS
The Effects of Weed-Cutting on the Macro-Inverterate Fauna of a Canalised Section of the River Hull, A Northern English Chalk Stream,
W79-02002 5C

Quantification, Decision-Making and Environmental Impact Assessment in the United Kingdom.
W79-02028 6G

Sedimentation in Hot Creek in Vicinity of Hot Creek Fish Hatchery, Mono County, California,
W79-02128 2J

Environmental Impact Assessment: An Aquatic Biologist's Point of View,
W79-02222 6G

Land Use and Intensive Range Management in the Sierra Nevada Foothills--A Contemporary Analysis,
W79-02293 4D

Aquatic Disposal Field Investigations Duwamish Waterway Disposal Site Puget Sound, Washington, Evaluative Summary,
W79-02350 5C

Hazardous Waste Disposal Damage Reports, Document No 2.
W79-02443 5E

ENVIRONMENTAL EVALUATION SYSTEM
Quantification, Decision-Making and Environmental Impact Assessment in the United Kingdom.
W79-02028 6G

ENZYMES
The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

EPIPHYTES
Seasonal Changes in the Epiphyte Community of Natural and Artificial Macrophytes in Lake Memphremagog (QUE. and VT.),
W79-02232 5C

EQUATIONS
Dynamic Analysis of Commercial Fishing Model,
W79-02063 6C

EQUILIBRIUM
The Long-Run Movement of the Prices of Exhaustible Resources,
W79-02026 6C

EROSION
Land Use and Intensive Range Management in the Sierra Nevada Foothills--A Contemporary Analysis,
W79-02293 4D

ESSENTIAL NUTRIENTS
The Uptake, Retention, and Release of Ammonium by Reef Corals,
W79-02228 5C

ESTHWAITE WATER (UNITED KINGDOM)
Specific Blue-Green Algal Carotenoids in Sediments of Esthwaite Water,
W79-02246 5C

ESTIMATING EQUATIONS
An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships of Lakes,
W79-02247 5C

ESTUARIES
Transportation and Accumulation of Fine-Grained Sediments in the Estuarine Environment: Recommendations for Research,
W79-02165 2L

Surface Drifter Movements Observed in Port Angeles Harbor and Vicinity, April 1978,
W79-02221 2L

Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay,
W79-02223 5C

Polychlorinated Biphenyls in Coastal Marine Zooplankton: Bioaccumulation by Equilibrium Partitioning,
W79-02242 5C

Velocity Averaging in Estuaries Characterized by a Large Tidal Range to Depth Ratio,
W79-02355 2L

ESTUARINE ENVIRONMENT
Transportation and Accumulation of Fine-Grained Sediments in the Estuarine Environment: Recommendations for Research,
W79-02165 2L

Intertidal Environment of Northern Dublin Bay,
W79-02204 5B

ESTUARINE FLOW VELOCITIES
Velocity Averaging in Estuaries Characterized by a Large Tidal Range to Depth Ratio,
W79-02355 2L

EUTROPHICATION
A Survey of Phosphorus and Nitrogen Levels in Treated Municipal Wastewater,
W79-02003 5A

A Dynamic Lake Model for Trophic State Prediction,
W79-02006 5C

Examination of a Lake Model,
W79-02007 5C

A Simulation Model for Phytoplankton Growth and Nutrient Cycling in Eutrophic, Shallow Lakes,
W79-02008 5C

Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

Kinetics of Phosphate Uptake by Aquatic Microorganisms: Deviations from a Simple Michaelis-Menten Equation,
W79-02016 5C

Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

The Role of Silica and the Vernal Diatom Bloom in Controlling the Growth of Nuisance Algal Populations in Lakes,
W79-02152 5C

Blooms of Surf-Zone Diatoms Along the Coast of the Olympic Peninsula, Washington, IX. Factors Controlling the Seasonal Cycle of Nitrate in the Surf at Copalis Beach (1971 through 1975),
W79-02244 5C

Specific Blue-Green Algal Carotenoids in Sediments of Esthwaite Water,
W79-02246 5C

An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships of Lakes,
W79-02247 5C

Recent Changes in Plankton Communities and Present Trophic State of Lake Steinsfjord,
W79-02250 5C

A Paleolimnological Comparison of Burntside and Shagawa Lakes, Northeastern Minnesota,
W79-02295 5C

The Release of Plant Nutrients from Reed Borders and its Transport into the Open Waters of the Bodensee-Untersee, (In German),
W79-02422 5C

Influence of Silver Carp (Hypophtalmichthys Molitrix) on Plankton of Shallow Waters According to Investigations in Carp Ponds (Wirkungen Von Silberkarpfen (Hypophthalmichtmys Molitrix) Auf Das Plankton in Flachcewassern Nach Untersuchungen in Karpfenteichen),
W79-02457 5C

EVALUATION
A Simulation Model for Resource Policy Evaluation,
W79-02025 6A

Quantification, Decision-Making and Environmental Impact Assessment in the United Kingdom.
W79-02028 6G

Procedure for the Evaluation of Environmental Monitoring Laboratories,
W79-02149 5A

Environmental Impact Assessment: An Aquatic Biologist's Point of View,
W79-02222 6G

Identification and Delineation of Freshwater Wetland Values,
W79-02402 6B

EVAPORATION
Advection Modification of the Priestley and Taylor Evapotranspiration Formula,
W79-02395 2D

EVAPOTRANSPIRATION
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

The Micro-Climate of Narrow- and Wide-Row Sorghum With Equal Plant Densities,
W79-02358 2D

Advection Modification of the Priestley and Taylor Evapotranspiration Formula,
W79-02395 2D

Evapotranspiration Estimates for Water Right Transfers,
W79-02491 2D

EVAPOTRANSPIRATION ESTIMATES
Evapotranspiration Estimates for Water Right Transfers,
W79-02491 2D

EXCLUSIVE ECONOMIC ZONE
A Note on the Welfare-Economic Consequences of Extended Fishing Limits,
W79-02047 6E

The Economic Consequences of the 200-Mile Seabed Zone: The Replenishable Resources Case,
W79-02048 6E

EXPLORATION
The Blind Zone in Seismic Ground-Water Exploration,
W79-02190 4B

EXPORT
Overseas Markets for the Water Industry - Nigeria,
W79-02030 5G

Optimal and Competitive Use of Replenishable Natural Resources by Open Economies.
W79-02058 6C

FACIES (SEDIMENTARY)
Subsurface Geological Investigation of a Pleistocene Braided Stream in the Northern Coastal Plain, Delaware (U.S.A.),
W79-02167 2J

FALLOUT
Atmospheric Formation, Dispersion, and Deposition of Acid Substances,
W79-02015 5A

FARM WASTES
Protein Production Rates by Algae Using Swine Manure as a Substrate,
W79-02489 5D

FAULTS
Holocene Faulting in the Western Grand Canyon, Arizona,
W79-02496 2J

FEDERAL-STATE WATER RIGHTS CONFLICTS
Procedural Inconsistencies and Substantive Issues in the Federal Reserved Water Rights Doctrine. Case Note, United States v. Akin, 504 F.2d 115 (10th Cir. 1974),
W79-02084 6E

FEDERAL WATER POLLUTION CONTROL AMENDMENTS OF 1977
EPA's Construction Grants Program: Perspectives Costs,
W79-02027 5G

FEEDING RATES
The Influence of Salinity and Temperature on Growth, Metabolism and Lethal Temperature of the Sand Goby, Pomatoschistus Microps K. (Der Einfluss Von Salzgehalt und Temperatur Auf Wachstum Stoffwechsel und Letaltemperatur Der Strandgrundel Pomatoschistus Microps K.),
W79-02466 5C

FERNS
Seasonal Changes in the Distribution of Water Fern and Duckweed in Cypress Domes Receiving Sewage,
W79-02262 2I

FERTILIZATION
Zinc Nutrition of Rice as Influenced by Rates of Gypsum and Zn Fertilizaton of Alkali Soils,
W79-02099 3F

FERTILIZERS
Sugar Cane Growth in Response to Mulch and Fertilizer on Saline-Alkali Subsoils,
W79-02029 3C

Residual Forms of Fertilizer Nitrogen in Field Soils,
W79-02364 2K

FILAMENTOUS ALGAE
Use of Fluorescence Microscopy for Quantifying Phytoplankton, Especially Filamentous Blue-Green Algae,
W79-02239 5C

FILTERS
Drive Device for Rake Arm with Attached Screen Comb in Cleaning Device for a Water Conduit Screen,
W79-02306 8C

FILTRATION
Filration System,
W79-02332 5D

FINANCING
Financing System Changes,
W79-02023 6C

Structuring Water Utility Bond Issues to Cope with Inflation,
W79-02024 6C

EPA's Construction Grants Program: Perspectives Costs,
W79-02027 5G

FINE GRAINED SOILS
Perimeter Dike Raising with Dewatered Fine-Grained Dredged Material at Upper Polecat Bay Disposal Area, Mobile, Alabama,
W79-02345 5E

FIRMS
'The Relationship Between Firm and Fishery in Common Property Fisheries': Comment,
W79-02060 6B

'The Relationship Between Firm and Fishery in Common Property Fisheries': Reply,
W79-02061 6B

FISH
Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

Application of a Model of Zooplankton Composition to Problems of Fish Introductions to the Great Lakes,
W79-02020 5C

Fish Test With Golden Orfe -- Testing the Toxicity of Matter Contained in Water (Fischtest mit Goldorfen -- Pruefung der Toxizitaet von Wasserinhaltsstoffen),
W79-02375 5C

Ecological Effects of Cooling Water of a Power Plant at Kiel Fjord,
W79-02461 5C

FISH BEHAVIOR
Thermal Tolerance and Preference of the Indian Catfish Heteropneustes Fossilis,
W79-02455 5C

FISH CONTROL AGENTS
Effect of Antimycin on Stream Insects in Field and Laboratory Trials,
W79-02156 5C

FISH DISEASES
Blood Corpuscle Resistance of Carp Died of Environmental Hypoxia and of Cyanide Poisoning, (In Japanese),
W79-02471 5C

FISH EGGS
On the Uptake of Three Different Types of Hydrocarbons by Salmon Eggs (Salmo Salar L.),
W79-02464 5C

FISH FARMING
Fish Farms are Having to Watch Their Waste.
W79-02474 5G

FISH MANAGEMENT
Optimal Utilization and the Control of Fisheries,
W79-02065 6B

Mathematical Models of a Fishery,
W79-02069 6B

FISH PHYSIOLOGY
Influence of Water Soluble Excreta on Oxygen Consumption of Tilapia Zillii,
W79-02462 5C

FISH POPULATIONS
Studies of the Ecology of Fish Populations in the Rye Meads Sewage Effluent Lagoons,
W79-02454 5C

FISH REPRODUCTION
Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

Studies of the Ecology of Fish Populations in the Rye Meads Sewage Effluent Lagoons,
W79-02454 5C

Effect of Methallibure on the Hypophysis and Gonadal Development of the Cichlid Fish, Tilapia Mossambica,
W79-02477 5C

FISH WASTES
Influence of Water Soluble Excreta on Oxygen Consumption of Tilapia Zillii,
W79-02462 5C

FISHERIES
The Economic Consequences of the 200-Mile Seabed Zone: The Replenishable Resources Case,
W79-02048 6E

'The Relationship Between Firm and Fishery in Common Property Fisheries': Comment,
W79-02060 6B

'The Relationship Between Firm and Fishery in Common Property Fisheries': Reply,
W79-02061 6B

Dynamic Analysis of Commercial Fishing Model,
W79-02063 6C

Optimal Utilization and the Control of Fisheries,
W79-02065 6B

Optimization and Suboptimization in Fishery Regulation,
W79-02066 6B

Optimization and Suboptimization in Fishery Regulation: Comment,
W79-02067 6B

General Equilibrium with a Replenishable Natural Resource,
W79-02068 6B

Mathematical Models of a Fishery,
W79-02069 6B

Exploitation of Common-Property Replenishable Natural Resources,
W79-02070 6B

FISHING LIMITS
A Note on the Welfare-Economic Consequences of Extended Fishing Limits,
W79-02047 6E

The Economic Consequences of the 200-Mile Seabed Zone: The Replenishable Resources Case,
W79-02048 6E

FLASH FLOODS
Disaster Response to Flash Flood,
W79-02193 8B

Forecast of the Flash Flood Hydrograph on the Ingoda River,
W79-02207 4A

FLOATING PLANT
Seasonal Changes in the Distribution of Water Fern and Duckweed in Cypress Domes Receiving Sewage,
W79-02262 2I

FLOATING PLANTS
The Colonization of Cabora Bassa, Mocambique, A New Man-Made Lake, by Floating Aquatic Macrophytes,
W79-02231 4A

FLOOD CONTROL
Magnitude and Frequency of Flooding on the Myakka River, Southwest Florida,
W79-02129 4A

FLOOD FORECASTING
Flood-Plain Delineation for Cub Run Basin, Fairfax County, Virginia,
W79-02137 2E

Forecast of the Flash Flood Hydrograph on the Ingoda River,
W79-02207 4A

FLOOD FREQUENCY
Flood-Plain Delineation for Cub Run Basin, Fairfax County, Virginia,
W79-02137 2E

FLOOD-PLAIN DELINEATION
Flood-Plain Delineation for Cub Run Basin, Fairfax County, Virginia,
W79-02137 2E

FLOOD-PLAIN MAPPING
Flood-Plain Delineation for Cub Run Basin, Fairfax County, Virginia,
W79-02137 2E

FLOOD PLAINS
Magnitude and Frequency of Flooding on the Myakka River, Southwest Florida,
W79-02129 4A

Flood-Plain Delineation for Cub Run Basin, Fairfax County, Virginia,
W79-02137 2E

FLOOD PROFILES
Magnitude and Frequency of Flooding on the Myakka River, Southwest Florida,
W79-02129 4A

Flood-Plain Delineation for Cub Run Basin, Fairfax County, Virginia,
W79-02137 2E

FLOODING
Effects of Simulated Flooding on Alligator Eggs,
W79-02116 2L

FLOODPLAIN MANAGEMENT
A Non-Linear Programming Approach to Floodplain Management with Non-Structural Alternatives,
W79-02400 6F

FLOODS
Some Comparisons of Flood Statistics in Real and Log Space,
W79-02119 2E

Control of 1973 Mississippi River Flood,
W79-02195 4A

FLORIDA
The Autecology of Sawgrass in the Florida Everglades,
W79-02104 2L

Forested Wetlands of Florida-Their Management and Use,
W79-02112 6B

Water Quality in the Old Plantation Water Control District, Broward County, Florida-Progress Report, July 1976-June 1977,
W79-02127 5B

Magnitude and Frequency of Flooding on the Myakka River, Southwest Florida,
W79-02129 4A

Hydrology of the Austin Cary Control Dome,
W79-02260 5E

Distribution of Chlorophyll in Cypress Ecosystems,
W79-02278 2I

Ecosystem Analyses at Corkscrew Swamp,
W79-02282 2I

Aquatic Vascular Plants of Lake Apopka, Florida,
W79-02420 2I

The Vegetation of Southern Florida,
W79-02425 2I

FLORIDAN AQUIFERS
Potential for Downward Leakage to the Floridan Aquifer, Green Swamp Area, Central Florida,
W79-02136 7C

FLOTATION
Device for the Removal of a Liquid Layer on Water,
W79-02337 5G

FLOW CHARACTERISTICS
Flow Characteristics of Streams in Tutuila, American Samoa,
W79-02124 2E

FLOW RATE
Disappearance of Nitrate Under Transient Conditions in Columns of Soil,
W79-02122 2G

FLOW RATES
Velocity Averaging in Estuaries Characterized by a Large Tidal Range to Depth Ratio,
W79-02355 2L

FLOW RESISTANCE
Simulated Flow Through the Root Xylem,
W79-02199 2I

FLUMES
Flume Experiments on Sand, Silt, and Clay Mixtures from the Offshore Dredged Material Disposal Site, Galveston, Texas,
W79-02348 5E

FLUORESCENCE
Use of Fluorescence Microscopy for Quantifying Phytoplankton, Especially Filamentous Blue-Green Algae,
W79-02239 5C

FLUVIAL SEDIMENTS
Sedimentation in Hot Creek in Vicinity of Hot Creek Fish Hatchery, Mono County, California,
W79-02128 2J

Subsurface Geological Investigation of a Pleistocene Braided Stream in the Northern Coastal Plain, Delaware (U.S.A.),
W79-02167 2J

FOAM CONTROL
Chemical Foam Control During Effluent Treatment in Aeration Tanks (Khimicheskoe penogashenie pri ochistke stochnykh vod v aerotenkakh),
W79-02382 5D

FOOD CHAINS
Recent Changes in Plankton Communities and Present Trophic State of Lake Steinsfjord,
W79-02250 5C

FOOD HABITS
Food Habits of Coastal Marsh Raccoons with Observations of Alligator Nest Predation,
W79-02117 2L

Alligator Diets in Relation to Marsh Salinity,
W79-02118 2L

FOOD PROCESSING
Proceedings of the Interstate Seafood Seminar October 4-7, 1977.
W79-02163 5G

FOOD PROCESSING INDUSTRY
Winery Wastewater Characteristics and Treatment,
W79-02297 5D

Characterization and In-Plant Reduction of Wastewater from Hog Slaughtering Operations,
W79-02298 5D

Treatment of High Strength Meatpacking Plant Wastewater by Land Application,
W79-02301 5D

FOOD WEBS
Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

FORAGE GRASSES
Differential Effect of Bermuda and Bahiagrasses on Soil Chemical Characteristics,
W79-02381 3F

FORECASTING
Mechanism of Formation and Forecast of the Development of the Volga Delta,
W79-02210 2J

Stochastic Modeling for Predicting Frequency Distribution of Stages in Thermal Lakes at Future Planning Horizons,
W79-02495 4A

FOREST MANAGEMENT
Effects of Forest Workings on Streamflow and Water Quality (Part I),
W79-02005 5C

Accelerating Secondary Succession in Cypress Strands,
W79-02283 2I

Brook: A Hydrologic Simulation Model for Eastern Forests,
W79-02448 4D

FOREST PRACTICES
Consequences of Site Disturbances in the Upper Coastal Plain,
W79-02431 4D

FOREST WATERSHEDS
Effects of Forest Workings on Streamflow and Water Quality (Part I),
W79-02005 5C

Interim Recommendation for the Use of Buffer Strips for the Protection of Small Streams in the Maritimes,
W79-02384 5G

Water Quality of Streamflow from Forested Watersheds on Sedimentary Soils,
W79-02404 5B

FORESTS
Natural Resources and Regional Disparities: A Skeptical View,
W79-02034 6B

Brook: A Hydrologic Simulation Model for Eastern Forests,
W79-02448 4D

FORMATION WATER
Origins of Water and Solutes in the Geopressured Zones of the Northern Gulf of Mexico Basin,
W79-02131 2K

FOSSIL GRADIENTS
Fossil Ground-Water Gradients in Arid Regional Sedimentary Basins,
W79-02189 2F

FREEZING
Computation of Soil Freezing Depth in the Zone of Aeration,
W79-02215 2C

FREQUENCY ANALYSIS
Long-Period Ground-Water Regime in the Excessively Wet Zone of the European USSR,
W79-02212 2F

FREQUENCY DISTRIBUTION
Stochastic Modeling for Predicting Frequency Distribution of Stages in Thermal Lakes at Future Planning Horizons,
W79-02495 4A

FRESHWATER FISH
Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

FUELS
Bioaccumulation Potential and Acute Toxicity of Synthetic Fuels Effluents in Freshwater Biota: Azaarenes,
W79-02241 5C

GALVESTON (TEX)
Flume Experiments on Sand, Silt, and Clay Mixtures from the Offshore Dredged Material Disposal Site, Galveston, Texas,
W79-02348 5E

GAMMA RAYS
Material Content of Binary Physical Mixture as Measured with a Dual-Energy Beam of Gamma Rays,
W79-02356 2G

GASES
Air Emissions from Cypress Swamps,
W79-02266 5C

GENERAL EQUILIBRIUM MODELS
General Equilibrium with a Replenishable Natural Resource,
W79-02068 6B

GEOCHEMISTRY ADSORPTION
Trace Element of the Sardis Reservoir, Mississippi, as Related to Clay Mineral Dispersion,
W79-02187 2H

GEOLOGIC CONTROL
Structural Control of the Rapids and Pools of the Colorado River in the Grand Canyon,
W79-02200 2E

GEOLOGIC FORMATIONS
A Contribution to the Lake Pleistocene Stratigraphy of the Susquehanna River Valley of New York,
W79-02135 2J

GEOLOGIC MAPPING
Hydrology of the Austin Cary Control Dome,
W79-02260 5E

GEOMORPHOLOGY
Study of River Meandering in the Search for Tectonic Structures (As Exemplified by the Middle Dniester Region),
W79-02205 8E

Mechanism of Formation and Forecast of the Development of the Volga Delta,
W79-02210 2J

GEOPHYSICAL EXPLORATION
Geophysical Delineation of Buried Glacial River Valley Aquifers in Grundy County, Missouri,
W79-02154 2F

GEORGIA
P-32 Uptake in Lentic Algae,
W79-02078 5C

Water Resources Data for Georgia, Water Year 1977.
W79-02141 7C

GEOTHERMAL DEVELOPMENT
Survey of Environmental Regulations Applying to Geothermal Exploration, Development, and Use,
W79-02410 5G

GEOTHERMAL STUDIES
Origins of Water and Solutes in the Geopressured Zones of the Northern Gulf of Mexico Basin,
W79-02131 2K

GEYSERS
Tritium in the Waters of Yellowstone National Park,
W79-02130 2F

GHYBEN-HERZBERG
Flotation of Fresh Water on Sea Water, A Historical Note,
W79-02171 2F

GLACIAL AQUIFERS
Geophysical Delineation of Buried Glacial River Valley Aquifers in Grundy County, Missouri,
W79-02154 2F

Subsurface Stratigraphy and Water Resources of Cass County, Indiana,
W79-02185 4B

GLUMSO LAKE (DENMARK)
Examination of a Lake Model,
W79-02007 5C

GONYAULAX EXCAVATA
Potential Importance of Benthic Cysts of Gonyaulax Tamarensis and G. Excavata Initiating Toxic Dinoflagellate Blooms,
W79-02011 5C

GONYAULAX TAMARENSIS
Potential Importance of Benthic Cysts of Gonyaulax Tamarensis and G. Excavata Initiating Toxic Dinoflagellate Blooms,
W79-02011 5C

GRADIENTS (STREAMS)
Gradient, Discharge, and Particle-Size Relations of Alluvial Channels in Kansas, With Observations on Braiding,
W79-02120 2J

GRAND CANYON
Structural Control of the Rapids and Pools of the Colorado River in the Grand Canyon,
W79-02200 2E

GRANTS
EPA's Construction Grants Program: Perspectives Costs,
W79-02027 5G

GRASSES
The Nature of Growth Forms in the Salt Marsh Grass Spartina Alterniflora,
W79-02087 2L

Differential Effect of Bermuda and Bahiagrasses on Soil Chemical Characteristics,
W79-02381 3F

GRAVITY SURVEY
Geophysical Delineation of Buried Glacial River Valley Aquifers in Grundy County, Missouri,
W79-02154 2F

GRAZING
Release of Dissolved Organic Carbon by Grazing Zooplankton,
W79-02234 5C

GREASE TRAPS
Grease Separator,
W79-02342 5D

GREAT BRITAIN
Overseas Markets for the Water Industry - Nigeria,
W79-02030 5G

GREAT PLAINS
Drought in the Upper Midwest, 1931-1969,
W79-02196 2B

GREAT SIPPEWISSETT MARSH (MA)
Nutrient and Particulate Fluxes in a Salt Marsh Ecosystem: Tidal Exchanges and Inputs by Precipitation and Groundwater,
W79-02235 5C

GREEN-AMPT EQUATION
Water Infiltration into Uniform and Stratified Soils I. Review and Use of an Approximate Theory,
W79-02492 2G

Water Infiltration into Uniform and Stratified Soils II. Experimental Evaluation of an Approximate Theory,
W79-02493 2G

GREEN SWAMP AREA (FLA)
Potential for Downward Leakage to the Floridan Aquifer, Green Swamp Area, Central Florida,
W79-02136 7C

GROUNDWATE
Surface Water VS. Ground Water,
W79-02176 4B

GROUNDWATER
Chemical Quality of Ground Water in Fairfax County, Virginia,
W79-02133 7C

Water Resources Data for Washington, Water year 1977--Volume 1. Western Washington.
W79-02138 7C

Water Resources Data for Washington, Water year 1977--Volume 2. Eastern Washington.
W79-02139 7C

Water Resources Data for Tennessee, Water Year 1977.
W79-02140 7C

High Plans - Ogallala Groundwater Studies,
W79-02172 4B

Model Aids Planners in Predicting Rising Ground-Water Levels in San Bernadino, California,
W79-02173 4B

Subsurface Stratigraphy and Water Resources of Cass County, Indiana,
W79-02185 4B

The Blind Zone in Seismic Ground-Water Exploration,
W79-02190 4B

The Impact of the Use of Heat Pumps on Groundwater Temperatures,
W79-02192 4B

Role of Ground Waters in the Formation of the Total Runoff of a Small Drainage Basin in the Forest Zone,
W79-02211 4B

Long-Period Ground-Water Regime in the Excessively Wet Zone of the European USSR,
W79-02212 2F

An Evaluation of Isotope Concentrations in the Ground Water of Saudi Arabia,
W79-02254 2F

Ground Water...California's Priceless Resource,
W79-02392 4B

Development of a Stream-Aquifer Model Suited for Management,
W79-02450 4B

GROUNDWATER AVAILABILITY

Geology and Groundwater Resources of Northern Berks County, Pennsylvania,
W79-02132 2F

Major Aquifers in Clark County, South Dakota,
W79-02134 2F

GROUNDWATER GRADIENTS

Fossil Ground-Water Gradients in Arid Regional Sedimentary Basins,
W79-02189 2F

GROUNDWATER MINING

Land Subsidence Due to Water Withdrawal in the Vicinity of Pecos, Texas,
W79-02396 4B

GROUNDWATER MOVEMENT

Tritium in the Waters of Yellowstone National Park,
W79-02130 2F

Fossil Ground-Water Gradients in Arid Regional Sedimentary Basins,
W79-02189 2F

GROUNDWATER RECHARGE

Potential for Downward Leakage to the Floridan Aquifer, Green Swamp Area, Central Florida,
W79-02136 7C

GROUNDWATER RESOURCES

Public Groundwater Supplies in Kane County,
W79-02075 4B

Geology and Groundwater Resources of Northern Berks County, Pennsylvania,
W79-02132 2F

Major Aquifers in Clark County, South Dakota,
W79-02134 2F

GROUNDWATER SOURCES

Geophysical Delineation of Buried Glacial River Valley Aquifers in Grundy County, Missouri,
W79-02154 2F

GROWTH RATES

Cypress Growth Response in a Sewage-Enriched Pond Cypress Ecosystem,
W79-02287 5C

Studies of the Ecology of Fish Populations in the Rye Meads Sewage Effluent Lagoons,
W79-02454 5C

Effects of Some Environmental Factors on Growth and Food Consumption of the Baltic Palaemonid Shrimp, Palaemon Adspersus Var. Fabricii (Rathke),
W79-02465 5C

The Influence of Salinity and Temperature on Growth, Metabolism and Lethal Temperature of the Sand Goby, Pomatoschistus Microps K. (Der Einfluss Von Salzgehalt und Temperatur Auf Wachstum Stoffwechsel und Letaltemperatur Der Strandgrundel Pomatoschistus Microps K.),
W79-02466 5C

Growth-Influencing Substances in Sediment Extracts from a Subtropical Wetland: Investigation Using a Diatom Bioassay,
W79-02476 5C

GROWTH STAGES

Potential Importance of Benthic Cysts of Gonyaulax Tamarensis and G. Excavata Initiating Toxic Dinoflagellate Blooms,
W79-02011 5C

GULF COASTAL PLAIN

Geographic Variations in Salt Marsh Macrophyte Productions: A Review,
W79-02098 2H

GULF OF FINLAND

Seiches in the Baltic Sea and Their Effect on Floods in the Neva River Delta,
W79-02213 2L

GULF OF MEXICO

Control of 1973 Mississippi River Flood,
W79-02195 4A

Flume Experiments on Sand, Silt, and Clay Mixtures from the Offshore Dredged Material Disposal Site, Galveston, Texas,
W79-02348 5E

GULF OF MEXICO

Origins of Water and Solutes in the Geopressured Zones of the Northern Gulf of Mexico Basin,
W79-02131 2K

GYPSUM

Zinc Nutrition of Rice as Influenced by Rates of Gypsum and Zn Fertilizaton of Alkali Soils,
W79-02099 3F

HARBOR SEALS

Further Data on Heavy Metals and Organochlorines in Marine Mammals from German Coastal Waters,
W79-02460 5B

HARBORS

Liquefaction Potential of Hydraulic Fills,
W79-02203 8D

HARVESTING

Increasing Efficiency of Aquatic Plant Management Through Processing,
W79-02158 4A

HATCHING

Effects of Simulated Flooding on Alligator Eggs,
W79-02116 2L

HAZARDOUS WASTES

Assessment of Hazardous Waste Practices in the Petroleum Refining Industry,
W79-02440 5D

HAZARDS

Hazardous Material Spills: A Documentation and Analysis of Historical Data,
W79-02411 5G

HEART COCKLE

Effects of Burial on the Heart Cockle Clinocardium Nuttallii and the Dungeness Crab Cancer Magister,
W79-02472 5C

HEAT EXCHANGERS

Research on Control Technology for Ice Fog From Mobile Sources,
W79-02147 5G

HEAT PUMPS

The Impact of the Use of Heat Pumps on Groundwater Temperatures,
W79-02192 4B

HEAT TREATMENT

Investigations of Heat Treatment for Paper Mill Sludge Conditioning,
W79-02296 5E

HEAVY METAL

Microorganisms and Heavy metal Toxicity,
W79-02483 5C

HEAVY METALS

Ability of Salt Marshes to Remove Nutrients and Heavy Metals from Dredged Material Disposa Area Effluents,
W79-02347 5E

Further Data on Heavy Metals and Organochlorines in Marine Mammals from German Coastal Waters,
W79-02460 5B

HEBER WATERSHED (ARIZ)

Water Quality of Streamflow from Forested Watersheds on Sedimentary Soils,
W79-02404 5B

HEIGHT

Physical Properties of Icebergs, Part I--Height to Draft Ratios of Icebergs, Part II--Mass Estimation of Arctic Icebergs,
W79-02216 2C

HEOD

Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

HEPATIC MICROSOMAL ENZYMES

The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

HERBICIDES

Field Persistence and Movement of Trifluralin in Two Soil Types,
W79-02417 2G

HETEROTHERMAL ENVIRONMENTS

Thermal Tolerance and Preference of the Indian Catfish Heteropneustes Fossilis,
W79-02455 5C

HETEROTROPHY
Growth-Influencing Substances in Sediment Extracts from a Subtropical Wetland: Investigation Using a Diatom Bioassay,
W79-02476 5C

HEXACHLOROBENZENE (HCB)
Organchlorines in Codfish from Harbours Along the Norwegian Coast,
W79-02479 5C

Effect of Hexachlorobenzene (HCB) on Photosynthetic Oxygen Evolution and Respiration of Chlorella Pyrenoidosa,
W79-02480 5C

HIGH FLOW
Flow Characteristics of Streams in Tutuila, American Samoa,
W79-02124 2E

HIGHWAY EFFECTS
Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands: Soil Relationships,
W79-02429 6G

HIGHWAY ICING
Optimization and Testing of Highway Materials to Mitigate Ice Adhesion,
W79-02408 8G

HISTOLOGICAL STUDIES
Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

HISTOLOGY
Possible Toxic Effects of the Marine Blue-Green Alga, Spirulina Subsalsa, on the Blue Shrimp, Penaeus Stylirostris,
W79-02459 5C

HISTORIC FLOODS
Some Comparisons of Flood Statistics in Real and Log Space,
W79-02119 2E

HISTORY
Flotation of Fresh Water on Sea Water, A Historical Note,
W79-02171 2F

A Hydraulic Installation in the Water Supply System of Emmaus-Nicopolis,
W79-02394 4A

The Water Supply System of Caesarea Maritima,
W79-02399 8B

HOGS
Characterization and In-Plant Reduction of Wastewater from Hog Slaughtering Operations,
W79-02298 5D

HOLOCENE MOVEMENT
Holocene Faulting in the Western Grand Canyon, Arizona,
W79-02496 2J

HOT CREEK
Sedimentation in Hot Creek in Vicinity of Hot Creek Fish Hatchery, Mono County, California,
W79-02128 2J

HOT SPRINGS
Tritium in the Waters of Yellowstone National Park,
W79-02130 2F

HUMAN DISEASES
Bioaccumulation Potential and Acute Toxicity of Synthetic Fuels Effluents in Freshwater Biota: Azaarenes,
W79-02241 5C

HYDRAULIC CONDUCTIVITY
Water Infiltration into Uniform and Stratified Soils I. Review and Use of an Approximate Theory,
W79-02492 2G

Water Infiltration into Uniform and Stratified Soils II. Experimental Evaluation of an Approximate Theory,
W79-02493 2G

HYDRAULIC DESIGN
The Water Supply System of Caesarea Maritima,
W79-02399 8B

HYDRAULIC GRADIENT
Fossil Ground-Water Gradients in Arid Regional Sedimentary Basins,
W79-02189 2F

HYDRAULIC MODELS
Physical Model Simulation of the Hydraulics of Masonboro Inlet, North Carolina,
W79-02353 8B

Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation,
W79-02354 8B

Hydraulic Model Tests of the Proposed Weir for the Richelieu River at St. Jean, Quebec,
W79-02414 8C

HYDRAULIC SIMILITUDE
Physical Model Simulation of the Hydraulics of Masonboro Inlet, North Carolina,
W79-02353 8B

HYDROGEN SULFIDE
Dissolved Hydrogen Sulfide in Soil Water in San Felasco Hammock and Deerhaven Cypress Dome,
W79-02285 5B

HYDROGEOLOGY
Geology and Groundwater Resources of Northern Berks County, Pennsylvania,
W79-02132 2F

Flotation of Fresh Water on Sea Water, A Historical Note,
W79-02171 2F

Hydrology of the Austin Cary Control Dome,
W79-02260 5E

HYDROGRAPH ANALYSIS
Forecast of the Flash Flood Hydrograph on the Ingoda River,
W79-02207 4A

HYDROLOGIC BUDGET
Complex Relations Between the Hydrologic Budget of the Major Geographic Zones of the Earth,
W79-02208 2A

Hydrologic Budget Model,
W79-02258 2H

HYDROLOGIC DATA
Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W79-02123 10D

Water Resources Data for Washington, Water year 1977--Volume 1. Western Washington.
W79-02138 7C

Water Resources Data for Washington, Water year 1977--Volume 2. Eastern Washington.
W79-02139 7C

Water Resources Data for Tennessee, Water Year 1977.
W79-02140 7C

Water Resources Data for Georgia, Water Year 1977.
W79-02141 7C

HYDROLOGIC EQUATION
Complex Relations Between the Hydrologic Budget of the Major Geographic Zones of the Earth,
W79-02208 2A

HYDROLOGIC PROPERTIES
Hydrology and Water Budgets of Cypress Domes,
W79-02257 5B

HYPOPHYSIS
Effect of Methallibure on the Hypophysis and Gonadal Development of the Cichlid Fish, Tilapia Mossambica,
W79-02477 5C

HYPOXIA
Blood Corpuscle Resistance of Carp Died of Environmental Hypoxia and of Cyanide Poisoning, (In Japanese),
W79-02471 5C

ICE FOG
Research on Control Technology for Ice Fog From Mobile Sources,
W79-02147 5G

ICEBERGS
Physical Properties of Icebergs, Part I--Height to Draft Ratios of Icebergs, Part II--Mass Estimation of Arctic Icebergs,
W79-02216 2C

ILLINOIS
Public Groundwater Supplies in Kane County,
W79-02075 4B

Control of 1973 Mississippi River Flood,
W79-02195 4A

Preliminary Evaluation of Final Cut Lakes,
W79-02292 5G

IMPACT (RAINFALL)
Splash and Discontinuous Runoff as Creators of Fine Sandy Lag Deposits with Kalahari Sands,
W79-02393 2J

IMPERIAL VALLEY (CALIF)
Making the Desert Flower: Irrigating California's Imperial Valley,
W79-02092 3F

IMPINGEMENT
Ecological Effects of Cooling Water of a Power Plant at Kiel Fjord,
W79-02461 5C

IMPOUNDMENTS
The Colonization of Cabora Bassa, Mocambique, A New Man-Made Lake, by Floating Aquatic Macrophytes,
W79-02231 4A

INDIAN CATFISH
Thermal Tolerance and Preference of the Indian Catfish Heteropneustes Fossilis,
W79-02455 5C

INDIANA
Subsurface Stratigraphy and Water Resources of Cass County, Indiana,
W79-02185 4B

INDICATORS
Implications of Alternative Measures of Natural Resource Scarcity,
W79-02049 6B

INDUSTRIAL PRODUCTION
Natural Resources and Environmental Restrictions to Growth,
W79-02056 6G

INDUSTRIAL WASTES
Process for Reducing the Mercury Content of Industrial Waste Waters,
W79-02313 5D

Method of Treating a Waste Liquid Containing Polluting Compounds,
W79-02324 5D

Process for Recovering Proteinaceous Matter from Acid Whey and Tannery Unhairing Effluents,
W79-02334 5D

Grease Separator,
W79-02342 5D

Waste Fluid Treatment System,
W79-02343 5D

Wastewater Treatment Technology Documentation for Toxaphene Manufacture,
W79-02439 5D

Assessment of Hazardous Waste Practices in the Petroleum Refining Industry,
W79-02440 5D

Wastewater Treatment Technology Documentation for DDT Manufacture,
W79-02444 5D

Benzidine: Wastewater Treatment Technology,
W79-02445 5D

INDUSTRIAL WATER
Polyquaternary Compounds for the Control of Microbiological Growth,
W79-02331 5D

INDUSTRIES
Coordinating Public Utility Expansion, Industrial Siting and Pollution Control: A Working Dynamic Programming Algorithm,
W79-02039 5G

INFILTRATION
Transpiration Effects on Leaching Fractions,
W79-02019 3C

INFLATION (ECONOMIC)
Structuring Water Utility Bond Issues to Cope with Inflation,
W79-02024 6C

INGODA RIVER (USSR)
Forecast of the Flash Flood Hydrograph on the Ingoda River,
W79-02207 4A

INJECTION
Improved Techniques for Evaluating Carbonate Waterfloods in West Texas,
W79-02182 4B

Underground Injection Control Program Studied,
W79-02184 5G

INLAND WATERWAYS
Studying the Economics of a Waterway: A Critique of Studies of the McClellan-Kerr Arkansas River Navigation System,
W79-02052 6B

INORGANIC COMPOUNDS
Photosynthetic Rates of Marine Algae as a Function of Inorganic Carbon Concentration,
W79-02224 5C

Partial Characterization of Chlorinated Organics in Superchlorinated Septages and Mixed Sludges,
W79-02413 5D

INSECTICIDES
Wastewater Treatment Technology Documentation for Toxaphene Manufacture,
W79-02439 5D

Insecticide Persistence in Natural Seawater as Affected by Salinity, Temperature, and Sterility,
W79-02487 5B

INSECTS
Do Tides Affect Coastal Insect Communities,
W79-02089 2L

INSTITUTIONAL CONSTRAINTS
Urban Water: Access, Delivery and Institutional Scarcity,
W79-02036 6E

INSTREAM FLOW (WINTER)
Telemetric Determination of Salmonid Winter Micro-Habitat Occupation and Movement in Ice-Covered Streams,
W79-02157 7B

INSTRUMENTATION
Systematic Absorbance Errors with Technicon AutoAnalyzer II Colorimeters,
W79-02074 2K

Instruments for Monitoring the Quality of Natural and Waste Waters,
W79-02214 5A

Full-Season Rain Gauge Having Replaceable Charts for Making Profile Graphs,
W79-02304 7B

Material Content of Binary Physical Mixture as Measured with a Dual-Energy Beam of Gamma Rays,
W79-02356 2G

INTENSIVE SITE PREPARATION
Consequences of Site Disturbances in the Upper Coastal Plain,
W79-02431 4D

INTER-BASIN TRANSFER
Geographic Aspects of the Territorial Redistribution of Water Resources,
W79-02209 4A

INTERNATIONAL LAW
A Note on the Welfare-Economic Consequences of Extended Fishing Limits,
W79-02047 6E

The Economic Consequences of the 200-Mile Seabed Zone: The Replenishable Resources Case,
W79-02048 6E

Exploitation of Common-Property Replenishable Natural Resources,
W79-02070 6B

INTERNATIONAL TRADE
Overseas Markets for the Water Industry - Nigeria,
W79-02030 5G

The Price of Natural Resources,
W79-02045 6C

INTERNATIONAL WATERS
A Note on the Welfare-Economic Consequences of Extended Fishing Limits,
W79-02047 6E

The Economic Consequences of the 200-Mile Seabed Zone: The Replenishable Resources Case,
W79-02048 6E

INTERSTICES
Interstital Water Chemistry of Anoxic Long Island Sound Sediments. 2. Nutrient Regeneration and Phosphate Removal,
W79-02243 5C

INTERTIDAL AREAS
Intertidal Environment of Northern Dublin Bay,
W79-02204 5B

Soft-Shore Macrobenthos Along the South-West Coast of Wales,
W79-02240 5C

INVERTEBRATES
The Effects of Weed-Cutting on the Macro-Inverterate Fauna of a Canalised Section of the River Hull, A Northern English Chalk Stream,
W79-02002 5C

Aquatic Invertebrate Abundance in Relation to Changing Marsh Vegetation,
W79-02095 2H

Effect of Antimycin on Stream Insects in Field and Laboratory Trials,
W79-02156 5C

The Response of Benthic Invertebrate Populations to Sewage Addition,
W79-02267 5C

ION TRANSPORT
Role of Inorganic Ions in Controlling Sedimentation Rate of a Marine Centric Diatom Ditylum Brightwelli,
W79-02014 5C

Ion Mobilities in Pure Water Vapour at Saturation,
W79-02076 1B

IRELAND
Intertidal Environment of Northern Dublin Bay,
W79-02204 5B

IRON BACTERIA
Redox Potential Measurements as an Indication of Biochemical Well Plugging,
W79-02170 5A

Investigation of the Microflora of Swamp Ore and Lake Water by the Method of Electron Microscopy, (In German),
W79-02423 5A

IRON OXIDES
Mechanism of Zinc Adsorption by Iron and Aluminum Oxides,
W79-02359 2K

IRRIGATION
Issues in Water Development Decisions: A Discussion Paper,
W79-02042 6B

Water Utilization and Reallocation in Chile: A Study of the Pirque Valley,
W79-02053 6B

Water Quality Can Affect Management Planning,
W79-02096 5G

Reciprocable Sprinkler,
W79-02318 3F

Wind, Sprinkler Patterns, and System Design,
W79-02368 3F

IRRIGATION DESIGN
Wind, Sprinkler Patterns, and System Design,
W79-02368 3F

IRRIGATION EFFECTS
Tillage Effects on Winter Wheat Production Where the Irrigated and Dryland Crops are Alternated,
W79-02088 3F

Controlling Sediment in Surface Runoff,
W79-02097 3F

IRRIGATION EFFICIENCY
Drip Study Shows up to 30% Water Savings,
W79-02090 3F

Wind, Sprinkler Patterns, and System Design,
W79-02368 3F

IRRIGATION PRACTICES
Calculating the Cost of Each Irrigation,
W79-02094 3F

Treatment of High Strength Meatpacking Plant Wastewater by Land Application,
W79-02301 5D

ISOTOPE STUDIES
Chemical Characterization of Local and Stratospheric Plutonium in Ohio Soils,
W79-02320 5A

ISRAEL
The Nature of Basalt Weathering in Israel,
W79-02238 2G

ISRAEL (HULA VALLEY)
Hula Valley Peat: Review of Chemical and Geochemical Aspects,
W79-02365 2K

IWANAI HARBOR (JAPAN)
The Effect of Silt-Fence on the Prevention of Sea Water Siltation Caused by Dredging and Reclaiming Work in Harbor, (In Japanese),
W79-02481 5C

JAPAN
Effects of Forest Workings on Streamflow and Water Quality (Part I),
W79-02005 5C

JET PUMPS
Water Systems Basics, (2),
W79-02181 8C

KANE COUNTY (ILL)
Public Groundwater Supplies in Kane County,
W79-02075 4B

KANSAS
Gradient, Discharge, and Particle-Size Relations of Alluvial Channels in Kansas, With Observations on Braiding,
W79-02120 2J

KARST
The Origin of Labyrinth and Tower Karst and the Climatic Conditions Necessary for Their Development,
W79-02073 2F

KIEL FJORD
Ecological Effects of Cooling Water of a Power Plant at Kiel Fjord,
W79-02461 5C

KINETICS
Kinetics of Phosphate Uptake by Aquatic Microorganisms: Deviations from a Simple Michaelis-Menten Equation,
W79-02016 5C

Kinetics of Algal Transient Phosphate Uptake and the Cell Quota Concept,
W79-02237 5C

KOOTENAY LAKE (B C CANADA)
Simulation Model of Cryptomonas Ovata Population Dynamics in Southern Kootenay Lake, British Columbia,
W79-02225 5C

KRAFT MILLS
New Pulp Mill Strikes Low Profile.
W79-02102 5D

Sulfate Turpentine in Unpurified and Purified Effluents from the Baikal Pulp Mill (Sul'fatnyi skipidar v neochishchennykh i ochishchennykh stokakh Baikal'skogo Tsellyuloznogo Zavoda),
W79-02378 5B

LABORATORIES
Procedure for the Evaluation of Environmental Monitoring Laboratories,
W79-02149 5A

LABORATORY TESTS
Anion Exchange Method for the Determination of Plutonium in Water: Single-Laboratory Evaluation and Interlaboratory Collaborative Study,
W79-02145 5A

Strength and Behavior of Thick Waled Reinforced Concrete Conduits,
W79-02217 8F

Design and Proof Test Requirements for Precast Reinforced Concrete Box Culverts,
W79-02218 8F

Comparison of Methods for the Determination of Total Available Residual Chlorine in Various Sample Matrices,
W79-02412 5A

Partial Characterization of Chlorinated Organics in Superchlorinated Septages and Mixed Sludges,
W79-02413 5D

LABYRINTH KARST
The Origin of Labyrinth and Tower Karst and the Climatic Conditions Necessary for Their Development,
W79-02073 2F

LAGOONS
Hypersaline Lagoonal Deposits and Processes,
W79-02430 2L

LAKE APOPKA (FLA)
Aquatic Vascular Plants of Lake Apopka, Florida,
W79-02420 2I

LAKE BRIELLE (NETH)
Wind Induced Dispersion and Algal Growth in Shallow Lakes,
W79-02226 5G

LAKE CABORA BASSA (MOCAMBIQUE)
The Colonization of Cabora Bassa, Mocambique, A New Man-Made Lake, by Floating Aquatic Macrophytes,
W79-02231 4A

LAKE ERIE
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix A: Planktonic Communities, Benthic Assemblages, and Fishery,
W79-02346 5E

LAKE GEORGE (NY)
Maximum Depth Inhabited by Aquatic Vascular Plants,
W79-02249 5C

LAKE GRASMERE (ENGLAND)
The Crustacean Zooplankton of Grasmere Before and After a Change in Sewage Effluent Treatment,
W79-02458 5C

LAKE MEMPHREMAGOG (VT QUEBEC)
Seasonal Changes in the Epiphyte Community of Natural and Artificial Macrophytes in Lake Memphremagog (QUE. and VT.),
W79-02232 5C

LAKE MENDOTA (WIS)
The Role of Silica and the Vernal Diatom Bloom in Controlling the Growth of Nuisance Algal Populations in Lakes,
W79-02152 5C

LAKE MICHIGAN
A Material Balance Study of Polychlorinated Biphenyls in Lake Michigan,
W79-02017 5C

Application of a Model of Zooplankton Composition to Problems of Fish Introductions to the Great Lakes,
W79-02020 5C

LAKE ONTARIO
Application of a Model of Zooplankton Composition to Problems of Fish Introductions to the Great Lakes,
W79-02020 5C

LAKE SIDNEY LANIER (GEO)
P-32 Uptake in Lentic Algae,
W79-02078 5C

LAKE SIMCOE (ONTARIO)
Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

LAKE STAGES
Stochastic Modeling for Predicting Frequency Distribution of Stages in Thermal Lakes at Future Planning Horizons,
W79-02495 4A

LAKE STEINSFJORD (NORWAY)
Recent Changes in Plankton Communities and Present Trophic State of Lake Steinsfjord,
W79-02250 5C

LAKES
A Dynamic Lake Model for Trophic State Prediction,
W79-02006 5C

Examination of a Lake Model,
W79-02007 5C

A Simulation Model for Phytoplankton Growth and Nutrient Cycling in Eutrophic, Shallow Lakes,
W79-02008 5C

Organism Patchiness in Lakes Resulting from the Interaction Between the Internal Seiche and Planktonic Diurnal Vertical Migration,
W79-02009 5C

Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

The Productivity of Lake Champlain wit Regard to Waterfowl, Furbearers, and Other Wildlife,
W79-02114 2H

Limnology of Selected Lakes in Ohio - 1975,
W79-02126 2H

Preliminary Evaluation of Final Cut Lakes,
W79-02292 5G

LAKES

Production of Submerged Aquatic Plant Communities of Doodhadhari Lake Raipur, (M. P. India),
W79-02419 2I

Aquatic Vascular Plants of Lake Apopka, Florida,
W79-02420 2I

LAKES *PHYTOPLANKTON

An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships of Lakes,
W79-02247 5C

LAMINARIA SACCHARINA

Effects of Nitrate Concentration on the Growth and Physiology of Lominaria Saccharina (Phaeophyta) in Culture,
W79-02010 5C

LAND MANAGEMENT

Profile and Measurement of Social Well-Being Indicators for Use in the Evaluation of Water and Related Land Management Planning,
W79-02344 6B

LAND RECLAMATION

Establishment of Native Plants for the Rehabilitation of Paraho Processed Oil Shale in an Arid Environment,
W79-02391 4A

Nutrients in Subsurface and Runoff Waters of the Holland Marsh, Ontario,
W79-02428 5C

LAND SUBSIDENCE

Land Subsidence Due to Water Withdrawal in the Vicinity of Pecos, Texas,
W79-02396 4B

LAND USE

Forested Wetlands of Florida-Their Management and Use,
W79-02112 6B

Land Use and Intensive Range Management in the Sierra Nevada Foothills--A Contemporary Analysis,
W79-02293 4D

LANDFILLS

Liquefaction Potential of Hydraulic Fills,
W79-02203 8D

LANDSCAPING

Design and the Desert Environment: Landscape Architecture in the American Southwest,
W79-02389 3B

LATE PLEISTOCENE

A Contribution to the Lake Pleistocene Stratigraphy of the Susquehanna River Valley of New York,
W79-02135 2J

LAUREL CREEK (ONTARIO)

Particulate and Dissolved Organic Matter in a Small Partly Forested Ontario Stream,
W79-02252 5C

LAW OF THE SEA

A Note on the Welfare-Economic Consequences of Extended Fishing Limits,
W79-02047 6E

LAWNS

Lawn Sprinkler Distribution Patterns,
W79-02155 3F

LEACHATE

The Uptake of Dissolved Organic Matter by a Small Spring Stream,
W79-02248 5C

The Behavio of Sulfate on Salt Input in Podzolic Brown Earth,
W79-02321 2K

LEACHING

Transpiration Effects on Leaching Fractions,
W79-02019 3C

LEAD

The Pollution of Sea-Water in Nagasaki Bay in Summer 1976 and 1977, (In Japanese),
W79-02482 5B

LEAKAGE

Potential for Downward Leakage to the Floridan Aquifer, Green Swamp Area, Central Florida,
W79-02136 7C

LEAVES

The Uptake of Dissolved Organic Matter by a Small Spring Stream,
W79-02248 5C

Litterfall and Litter Decomposition in Four Cypress Domes,
W79-02265 2I

LEGISLATION

Changing Manner and Place of Use of Water Rights in Wyoming, Comments,
W79-02083 6E

An Examination of Legislation for the Protection of the Wetlands of the Atlantic and Gulf Coast States,
W79-02106 6E

Survey of Environmental Regulations Applying to Geothermal Exploration, Development, and Use,
W79-02410 5G

LETAL LIMIT

Thermal Tolerance and Preference of the Indian Catfish Heteropneustes Fossilis,
W79-02455 5C

LIGHT

Dependence of Light-Saturated Rates of Algal Photosynthesis on Intracellular Concentrations of Phosphorus,
W79-02236 5C

LIGHT PENETRATION

Maximum Depth Inhabited by Aquatic Vascular Plants,
W79-02249 5C

Radiation Studies: Cypress Wetlands,
W79-02261 2I

LIME

Limestone and Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02302 5D

LIMESTONE

Combination Limestone-Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02150 5D

LIMESTONES

Limestone and Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02302 5D

LIMITED ENTRY

'The Relationship Between Firm and Fishery in Common Property Fisheries': Comment,
W79-02060 6B

'The Relationship Between Firm and Fishery in Common Property Fisheries': Reply,
W79-02061 6B

LIMITING FACTORS

Effects of Nitrate Concentration on the Growth and Physiology of Lominaria Saccharina (Phaeophyta) in Culture,
W79-02010 5C

Blooms of Surf-Zone Diatoms Along the Coast of the Olympic Peninsula, Washington, IX. Factors Controlling the Seasonal Cycle of Nitrate in the Surf at Copalis Beach (1971 through 1975),
W79-02244 5C

LIMNOLOGY

Limnology of Selected Lakes in Ohio - 1975,
W79-02126 2H

A Paleolimnological Comparison of Burntside and Shagawa Lakes, Northeastern Minnesota,
W79-02295 5C

LITERATURE REVIEWS

Considerations in Conducting Bioassays,
W79-02349 5A

LIVESTOCK

Best Management Practices to Control Nonpoint-Source Pollution from Agriculture,
W79-02233 5G

LOCATING

Is It Time to Do a Benefit-Cost Analysis for the Location of a Power Plant,
W79-02054 6B

LOCKS

Bay Springs Canal Surge Study, Tennessee-Tombigbee Waterway, Mississippi and Alabama; Hydraulic Model Investigation,
W79-02352 8B

LONG BEACH (CALIF)

Liquefaction Potential of Hydraulic Fills,
W79-02203 8D

LONG ISLAND SOUND

Interstital Water Chemistry of Anoxic Long Island Sound Sediments. 2. Nutrient Regeneration and Phosphate Removal,
W79-02243 5C

LOS ANGELES (CALIF)

Liquefaction Potential of Hydraulic Fills,
W79-02203 8D

LOW FLOW

Flow Characteristics of Streams in Tutuila, American Samoa,
W79-02124 2E

Estimates of 7-Day, 10-Year Minimum Flows at Selected Stream Sites in Puerto Rico,
W79-02125 5B

LOW-FLOW FREQUENCY

Estimates of 7-Day, 10-Year Minimum Flows at Selected Stream Sites in Puerto Rico,
W79-02125 5B

LUMBERING

Effects of Forest Workings on Streamflow and Water Quality (Part I),
W79-02005 5C

Interim Recommendation for the Use of Buffer Strips for the Protection of Small Streams in the Maritimes,
W79-02384 5G

LYNGBY LAKE (DENMARK)

Examination of a Lake Model,
W79-02007 5C

LYSOGENY

The Characterization of Bacillus Capable of Blue-Green Bactericidal Activity,
W79-02159 5D

MACROPHYTES
Seasonal Changes in the Epiphyte Community of Natural and Artificial Macrophytes in Lake Memphremagog (QUE. and VT.),
W79-02232 5C

MAINE
New Pulp Mill Strikes Low Profile.
W79-02102 5D

MALATHION
Insecticide Persistence in Natural Seawater as Affected by Salinity, Temperature, and Sterility,
W79-02487 5B

MAMMALS
Food Habits of Coastal Marsh Raccoons with Observations of Alligator Nest Predation,
W79-02117 2L

MANAGEMENT
Forested Wetlands of Florida-Their Management and Use,
W79-02112 6B

Computer Assisted Instruction in Natural Resource Management,
W79-02161 7C

Management of Rural Water Supply Peak Flow Rates,
W79-02194 3D

Evaluation Models for Public Management of Freshwater Wetlands,
W79-02401 6B

MANGROVE SWAMPS
Growth-Influencing Substances in Sediment Extracts from a Subtropical Wetland: Investigation Using a Diatom Bioassay,
W79-02476 5C

MANILA (PHILIPPINES)
Urban Water: Access, Delivery and Institutional Scarcity,
W79-02036 6E

MANITOBA
Reaction Products and Solubility of Applied Zinc Compounds in Some Manitoba Soils,
W79-02362 2K

MANPOWER
Manpower Utilization and Future Needs of Manufacturing Industries in Water Pollution Control,
W79-02438 5G

MANPOWER PROJECTIONS
Manpower Utilization and Future Needs of Manufacturing Industries in Water Pollution Control,
W79-02438 5G

MAPPING
An Atlas of Vascular Plant Species Distribution Maps for Tidewater maryland,
W79-02109 2I

Quantitative Mapping by Remote Sensing of an Ocean Acid-Waste Dump,
W79-02407 5A

MAPS
An Atlas of Vascular Plant Species Distribution Maps for Tidewater maryland,
W79-02109 2I

Drainage Map of Arizona Showing Perennial Streams and Some Important Wetlands,
W79-02121 7C

Chemical Quality of Ground Water in Fairfax County, Virginia,
W79-02133 7C

Potential for Downward Leakage to the Floridan Aquifer, Green Swamp Area, Central Florida,
W79-02136 7C

MARINE ALGAE
Photosynthetic Rates of Marine Algae as a Function of Inorganic Carbon Concentration,
W79-02224 5C

Possible Toxic Effects of the Marine Blue-Green Alga, Spirulina Subsalsa, on the Blue Shrimp, Penaeus Stylirostris,
W79-02459 5C

Eco-Biochemical Studies on Some Economically Important Intertidal Algae from Port Okha (India),
W79-02475 5C

MARINE ANIMALS
Effects of an Organic Arsenical Herbicide on a Salt Marsh Ecosystem,
W79-02427 5C

MARINE MAMMALS
Further Data on Heavy Metals and Organochlorines in Marine Mammals from German Coastal Waters,
W79-02460 5B

MARINE MICROORGANISMS
Polychlorinated Biphenyls in Coastal Marine Zooplankton: Bioaccumulation by Equilibrium Partitioning,
W79-02242 5C

MARKETING
Overseas Markets for the Water Industry - Nigeria,
W79-02030 5G

MARSH PLANTS
Amino Acids in Salt Marsh Detritus,
W79-02086 5C

Aquatic Invertebrate Abundance in Relation to Changing Marsh Vegetation,
W79-02095 2H

An Atlas of Vascular Plant Species Distribution Maps for Tidewater maryland,
W79-02109 2I

Apparent Use of Sediment Nitrogen and Phorphorus by Plants in Malletts Creek Marsh with Implications to Lake Champlain Water Level Regulation,
W79-02115 2H

Uptake and Distribution of Phosphorus in the Understory of Cypress Domes,
W79-02264 5C

Earthquake-Initiated Changes in the Nesting Habitat of the Dusky Canada Goose,
W79-02416 2I

The Effect of Drawdown Date on Wetland Plant Succession,
W79-02424 2I

Effects of an Organic Arsenical Herbicide on a Salt Marsh Ecosystem,
W79-02427 5C

The Effects of Petroleum on the Salt Marsh Ecosystem,
W79-02485 5C

MARSHES
Angiosperm Production of Three Virginia Marshes in Various Salinity and Soil Nutrient Regimes,
W79-02108 2L

Alligator Diets in Relation to Marsh Salinity,
W79-02118 2L

Nutrients in Subsurface and Runoff Waters of the Holland Marsh, Ontario,
W79-02428 5C

MARYLAND
An Atlas of Vascular Plant Species Distribution Maps for Tidewater maryland,
W79-02109 2I

A Bibliography of Maryland's Tidal Wetlands (Marshes-Swamps),
W79-02111 2L

Two Drilling Methods Compared,
W79-02169 8B

MASONBORO INLET (NC)
Physical Model Simulation of the Hydraulics of Masonboro Inlet, North Carolina,
W79-02353 8B

MASS
Mass Balance Determinations for Pollutants in Urban Regions. Methodology with Applications to Lead, Zinc, Cadmium, and Arsenic.
W79-02148 5A

Physical Properties of Icebergs, Part I--Height to Draft Ratios of Icebergs, Part II--Mass Estimation of Arctic Icebergs,
W79-02216 2C

MASS LOADINGS (WASTES)
Pollutional Characteristics of Stormwater Runoff,
W79-02451 5B

MATERIALS TESTING
Optimization and Testing of Highway Materials to Mitigate Ice Adhesion,
W79-02408 8G

MATHEMATICA MODELS
A Simulation Model for Phytoplankton Growth and Nutrient Cycling in Eutrophic, Shallow Lakes,
W79-02008 5C

MATHEMATICAL MODELS
Significance of Nitrification in Stream Analysis-Effects on the Oxygen Balance,
W79-02001 5C

A Dynamic Lake Model for Trophic State Prediction,
W79-02006 5C

Examination of a Lake Model,
W79-02007 5C

A Material Balance Study of Polychlorinated Biphenyls in Lake Michigan,
W79-02017 5C

Application of a Model of Zooplankton Composition to Problems of Fish Introductions to the Great Lakes,
W79-02020 5C

Growth and Optimal Growth with Renewable and Non Renewable Natural Resources,
W79-02032 6A

On the Optimal Policy for Exploiting Renewable Resource Stocks,
W79-02040 6B

The Limited Applicability of Marshallian Economics to the Problem of Pollution Abatement: A Suggested Alternative,
W79-02041 5G

Econometric Analysis of Environmental Policy: Estimation of a Model of the Canadian Pulp and Paper Industry,
W79-02046 6B

Costly Innovation and Natural Resources,
W79-02062 6B

Dynamic Analysis of Commercial Fishing Model,
W79-02063 6C

Some Extensions of the Economic Theory of Exhaustible Resources,
W79-02064 6B

Mathematical Models of a Fishery,
W79-02069 6B

A Polluted Golden Age,
W79-02071 5G

Economics of Wilderness Resources,
W79-02072 6B

Model Aids Planners in Predicting Rising Ground-Water Levels in San Bernadino, California,
W79-02173 4B

Forecast of the Flash Flood Hydrograph on the Ingoda River,
W79-02207 4A

Complex Relations Between the Hydrologic Budget of the Major Geographic Zones of the Earth,
W79-02208 2A

Computation of Soil Freezing Depth in the Zone of Aeration,
W79-02215 2C

Wind Induced Dispersion and Algal Growth in Shallow Lakes,
W79-02226 5G

Comparison of the Predictive Accuracy of Models of Urban Flow and Water-Quality Processes,
W79-02253 5B

Planning and Modeling in Urban Water Management,
W79-02288 6B

Proceedings of a Workshop on the Evaluation of Models Used for the Environmental Assessment of Radionuclide Releases.
W79-02434 5B

A Model of the Biological Effects of Eutrophication in the North Sea,
W79-02469 5C

A Method of Predicting the Biological Effects of Synthetic Pollutants in the North Sea,
W79-02470 5C

MAUMEE BAY (OH)
Environmental Impact Assessment: An Aquatic Biologist's Point of View,
W79-02222 6G

MAUMEE RIVER (OH)
Environmental Impact Assessment: An Aquatic Biologist's Point of View,
W79-02222 6G

MAYFLIES
Effect of Antimycin on Stream Insects in Field and Laboratory Trials,
W79-02156 5C

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM
Studying the Economics of a Waterway: A Critique of Studies of the McClellan-Kerr Arkansas River Navigation System,
W79-02052 6B

MEANDERS
Study of River Meandering in the Search for Tectonic Structures (As Exemplified by the Middle Dniester Region),
W79-02205 8E

MEASUREMENT
Implications of Alternative Measures of Natural Resource Scarcity,
W79-02049 6B

An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships of Lakes,
W79-02247 5C

Flow Monitoring,
W79-02330 8G

MEATPACKING WASTES
Treatment of High Strength Meatpacking Plant Wastewater by Land Application,
W79-02301 5D

MECHANICAL CONTROL
The Effects of Weed-Cutting on the Macro-Inverterate Fauna of a Canalised Section of the River Hull, A Northern English Chalk Stream,
W79-02002 5C

Aquatic Plant Management in Semi-Natural Streams: The Role of Marginal Vegetation,
W79-02012 5G

MECHANICAL EQUIPMENT
Increasing Efficiency of Aquatic Plant Management Through Processing,
W79-02158 4A

MECHUMS RIVER (VA)
Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

MEMBRANE PROCESSES
New Membranes for Treating Metal Finishing Effluents by Reverse Osmosis,
W79-02300 5D

MERCURY
Volatility of Mercury from Soils Amended with Various Mercury Compounds,
W79-02142 5B

Process for Reducing the Mercury Content of Industrial Waste Waters,
W79-02313 5D

Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

Determination of Methylmercury in Fish of South Carolina,
W79-02478 5A

The Pollution of Sea-Water in Nagasaki Bay in Summer 1976 and 1977, (In Japanese),
W79-02482 5B

Microorganisms and Heavy metal Toxicity,
W79-02483 5C

Ethylmercury: Formation in Plant Tissues and Relation to Methylmercury Formation,
W79-02488 5A

Effects of Ingesting Mercury-Containing Bacteria on Mercury Tolerance and Growth Rates of Ciliates,
W79-02499 5C

MERCURY COMPOUNDS
Volatility of Mercury from Soils Amended with Various Mercury Compounds,
W79-02142 5B

MERCURY VOLATILIZATION
Volatility of Mercury from Soils Amended with Various Mercury Compounds,
W79-02142 5B

METABOLISM
The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

Influence of Water Soluble Excreta on Oxygen Consumption of Tilapia Zillii,
W79-02462 5C

On the Uptake of Three Different Types of Hydrocarbons by Salmon Eggs (Salmo Salar L.),
W79-02464 5C

Effects of Some Environmental Factors on Growth and Food Consumption of the Baltic Palaemonid Shrimp, Palaemon Adspersus Var. Fabricii (Rathke),
W79-02465 5C

The Influence of Salinity and Temperature on Growth, Metabolism and Lethal Temperature of the Sand Goby, Pomatoschistus Microps K. (Der Einfluss Von Salzgehalt und Temperatur Auf Wachstum Stoffwechsel und Letaltemperatur Der Strandgrundel Pomatoschistus Microps K.),
W79-02466 5C

Differential Elimination of Phenol by Diatoms and Other Unicellular Algae from Low Concentrations,
W79-02486 5C

METAL PLATING INDUSTRY
Waste Fluid Treatment System,
W79-02343 5D

METALS
Ethylmercury: Formation in Plant Tissues and Relation to Methylmercury Formation,
W79-02488 5A

METHALLIBURE
Effect of Methallibure on the Hypophysis and Gonadal Development of the Cichlid Fish, Tilapia Mossambica,
W79-02477 5C

METHODOLOGY
Structuring Water Utility Bond Issues to Cope with Inflation,
W79-02024 6C

A Simulation Model for Resource Policy Evaluation,
W79-02025 6A

Quantification, Decision-Making and Environmental Impact Assessment in the United Kingdom.
W79-02028 6G

Coefficients of Pollution: Interindustry Linkage and Pollution in Belgium,
W79-02031 5G

An Analysis of Network Costs: A Study of Sydney's Water Supply from 1890 to 2001, Part I: Research Methods,
W79-02033 6B

Implications of Alternative Measures of Natural Resource Scarcity,
W79-02049 6B

Measurement of Economic Uncertainty in Public Water Resource Development: An Extension,
W79-02050 6B

Measuring Natural Resources Scarcity: Theory and Practice,
W79-02059 6B

Use of Fluorescence Microscopy for Quantifying Phytoplankton, Especially Filamentous Blue-Green Algae,
W79-02239 5C

A Budget of Nitrogen Recycling in North Sea Sediments off the Belgian Coast,
W79-02245 5C

METHYLMERCURY
Determination of Methylmercury in Fish of South Carolina,
W79-02478 5A

Microorganisms and Heavy metal Toxicity,
W79-02483 5C

METHYLOXYCHLOR
Insecticide Persistence in Natural Seawater as Affected by Salinity, Temperature, and Sterility,
W79-02487 5B

METHYLPARATHION
Insecticide Persistence in Natural Seawater as Affected by Salinity, Temperature, and Sterility,
W79-02487 5B

MICHAELIS-MENTEN EQUATIONS
Kinetics of Phosphate Uptake by Aquatic Microorganisms: Deviations from a Simple Michaelis-Menten Equation,
W79-02016 5C

Photosynthetic Rates of Marine Algae as a Function of Inorganic Carbon Concentration,
W79-02224 5C

MICHIGAN
Vegetation Changes in a Small Michigan Bog from 1917 to 1972,
W79-02091 2H

Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands: Soil Relationships,
W79-02429 6G

MICROBIAL DEGRADATION
Model for Decomposition of Organic Material by Microorganisms,
W79-02415 2G

MICROBIOLOGY
Microorganisms and Heavy metal Toxicity,
W79-02483 5C

MICROENVIRONMENT
Consequences of Site Disturbances in the Upper Coastal Plain,
W79-02431 4D

MICROORGANISMS
Kinetics of Phosphate Uptake by Aquatic Microorganisms: Deviations from a Simple Michaelis-Menten Equation,
W79-02016 5C

Model for Decomposition of Organic Material by Microorganisms,
W79-02415 2G

Microorganisms and Heavy metal Toxicity,
W79-02483 5C

MICROSCOPY
Use of Fluorescence Microscopy for Quantifying Phytoplankton, Especially Filamentous Blue-Green Algae,
W79-02239 5C

MINE DRAINAGE
Combination Limestone-Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02150 5D

Limestone and Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02302 5D

MINE WASTES
Acid Mine Drainage and Subsidence: Effects of Increased Coal Utilization,
W79-02409 5G

MINERALIZATION
Model for Decomposition of Organic Material by Microorganisms,
W79-02415 2G

MINNESOTA
Wetland Road Crossing: Drainage Problems and Timber Damage,
W79-02421 4C

MISSISSIPPI
Trace Element of the Sardis Reservoir, Mississippi, as Related to Clay Mineral Dispersion,
W79-02187 2H

Dredge Spoil in Mississippi Sound,
W79-02188 5E

MISSISSIPPI RIVER
Control of 1973 Mississippi River Flood,
W79-02195 4A

Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation,
W79-02354 8B

MISSISSIPPI RIVER FLOOD
Control of 1973 Mississippi River Flood,
W79-02195 4A

MISSISSIPPI SOUND (MISS)
Dredge Spoil in Mississippi Sound,
W79-02188 5E

MISSOURI
Geophysical Delineation of Buried Glacial River Valley Aquifers in Grundy County, Missouri,
W79-02154 2F

MIXOTROPHY
Growth-Influencing Substances in Sediment Extracts from a Subtropical Wetland: Investigation Using a Diatom Bioassay,
W79-02476 5C

MODE OF ACTION
Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

MODEL APPLICATIONS
Planning and Modeling in Urban Water Management,
W79-02288 6B

MODEL STUDIES
A Simulation Model for Resource Policy Evaluation,
W79-02025 6A

The Limited Applicability of Marshallian Economics to the Problem of Pollution Abatement: A Suggested Alternative,
W79-02041 5G

Measuring Natural Resources Scarcity: Theory and Practice,
W79-02059 6B

High Plans - Ogallala Groundwater Studies,
W79-02172 4B

Transient Spherical Flow to a Nonpenetrating Well with Constant Drawdown,
W79-02191 4B

The Impact of the Use of Heat Pumps on Groundwater Temperatures,
W79-02192 4B

Comparison of the Predictive Accuracy of Models of Urban Flow and Water-Quality Processes,
W79-02253 5B

Cypress Wetlands for Water Management, Recycling and Conservation (Third Annual Report, November 1, 1975 to December 15, 1976),
W79-02256 2I

Hydrologic Budget Model,
W79-02258 2H

Planning and Modeling in Urban Water Management,
W79-02288 6B

Evaluation Models for Public Management of Freshwater Wetlands,
W79-02401 6B

Model for Decomposition of Organic Material by Microorganisms,
W79-02415 2G

Brook: A Hydrologic Simulation Model for Eastern Forests,
W79-02448 4D

A Model of the Biological Effects of Eutrophication in the North Sea,
W79-02469 5C

A Method of Predicting the Biological Effects of Synthetic Pollutants in the North Sea,
W79-02470 5C

MODELING COSTS
Planning and Modeling in Urban Water Management,
W79-02288 6B

MODELING SURVEY
Planning and Modeling in Urban Water Management,
W79-02288 6B

MODULAR STRUCTURES
Tire Module Systems in Shore and Harbor Protection,
W79-02201 8G

MOISTURE STRESS
Yield of Dryland Grain Sorghum as Affected by Antitranspirant, Nitrogen, and Contributing Micro-Watershed,
W79-02403 3F

MOLLUSKS
Effects of Thermal Discharges on Mortality of Mercenaria Mercenaria in Barnegat Bay, New Jersey,
W79-02473 5C

MONITORING
The Controversy Continues: State Ownership of Drill Rigs,
W79-02168 6E

Instruments for Monitoring the Quality of Natural and Waste Waters,
W79-02214 5A

Flow Monitoring,
W79-02330 8G

Scanning Apparatus for Septic Effluents,
W79-02340 5D

Remote Sensing Techniques and the Monitoring of Desertification Processes in Arid Areas,
W79-02390 7B

Water-Quality Monitoring in the American Urbanizing Southwest,
W79-02397 5B

MONTE CARLO METHOD
Some Comparisons of Flood Statistics in Real and Log Space,
W79-02119 2E

MONTMORILLONITE
Effects of Temperature and Time on Hydroxy Aluminum Phosphate-Montmorillonite Complex,
W79-02436 2G

MORTALITY
Blood Corpuscle Resistance of Carp Died of Environmental Hypoxia and of Cyanide Poisoning, (In Japanese),
W79-02471 5C

Effects of Thermal Discharges on Mortality of Mercenaria Mercenaria in Barnegat Bay, New Jersey,
W79-02473 5C

MOSQUITOES
Progress Repot on Mosquitoe Research: Cypress Domes,
W79-02281 5G

MOVEABLE-BED MODELS
Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation,
W79-02354 8B

MUD.
Effect of Barite (BASO4) on Development of Estuarine Communities,
W79-02484 5C

MULCHES
Sugar Cane Growth in Response to Mulch and Fertilizer on Saline-Alkali Subsoils,
W79-02029 3C

MULCHING
Increasing Efficiency of Aquatic Plant Management Through Processing,
W79-02158 4A

MULHOCKAWAY CREEK (NJ)
Storm Derived Losses of Phosphorus and their Significance to Annual Phosphorus Export from Two New Jersey Watersheds,
W79-02151 5B

MULLUSCS
Effects of Burial on the Heart Cockle Clinocardium Nuttallii and the Dungeness Crab Cancer Magister,
W79-02472 5C

MULTIPLE-PURPOSE PROJECTS
Studying the Economics of a Waterway: A Critique of Studies of the McClellan-Kerr Arkansas River Navigation System,
W79-02052 6B

MUNICIPAL WASTES
A Survey of Phosphorus and Nitrogen Levels in Treated Municipal Wastewater,
W79-02003 5A

MYAKKA RIVER BASIN (FL)
Magnitude and Frequency of Flooding on the Myakka River, Southwest Florida,
W79-02129 4A

MYXOXANTHOPHYLL
Specific Blue-Green Algal Carotenoids in Sediments of Esthwaite Water,
W79-02246 5C

NAGASAKI BAY (JAPAN)
The Pollution of Sea-Water in Nagasaki Bay in Summer 1976 and 1977, (In Japanese),
W79-02482 5B

NANNOPLANKTON
Net-And Nanoplankton: Effects of an Oil Spill in the North Sea,
W79-02467 5C

NAPHTHALENE
On the Uptake of Three Different Types of Hydrocarbons by Salmon Eggs (Salmo Salar L.),
W79-02464 5C

NATIONAL EUTROPHICATION SURVEY
A Survey of Phosphorus and Nitrogen Levels in Treated Municipal Wastewater,
W79-02003 5A

Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

NATIONAL PARKS
Tritium in the Waters of Yellowstone National Park,
W79-02130 2F

NATIONAL WATER DATA EXCHANGE (NAWDEX)
Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W79-02123 10D

NATURAL RESOURCES
A Simulation Model for Resource Policy Evaluation,
W79-02025 6A

The Long-Run Movement of the Prices of Exhaustible Resources,
W79-02026 6C

Growth and Optimal Growth with Renewable and Non Renewable Natural Resources,
W79-02032 6A

Natural Resources and Regional Disparities: A Skeptical View,
W79-02034 6B

On the Optimal Policy for Exploiting Renewable Resource Stocks,
W79-02040 6B

The Price of Natural Resources,
W79-02045 6C

Implications of Alternative Measures of Natural Resource Scarcity,
W79-02049 6B

Measuring Natural Resources Scarcity: Theory and Practice,
W79-02059 6B

Costly Innovation and Natural Resources,
W79-02062 6B

General Equilibrium with a Replenishable Natural Resource,
W79-02068 6B

Economics of Wilderness Resources,
W79-02072 6B

Computer Assisted Instruction in Natural Resource Management,
W79-02161 7C

NATURAL RESOURCES *SCARCITY
Natural Resources and Environmental Restrictions to Growth,
W79-02056 6G

NESTING COVER
Earthquake-Initiated Changes in the Nesting Habitat of the Dusky Canada Goose,
W79-02416 2I

NESTS
Food Habits of Coastal Marsh Raccoons with Observations of Alligator Nest Predation,
W79-02117 2L

NET RADIATION
The Micro-Climate of Narrow- and Wide-Row Sorghum With Equal Plant Densities,
W79-02358 2D

Advection Modification of the Priestley and Taylor Evapotranspiration Formula,
W79-02395 2D

NETHERLANDS
Coefficients of Pollution: Interindustry Linkage and Pollution in Belgium,
W79-02031 5G

NETWORKS
An Analysis of Network Costs: A Study of Sydney's Water Supply from 1890 to 2001, Part I: Research Methods,
W79-02033 6B

NEUTRALIZATION
Limestone and Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02302 5D

NEVA RIVER DELTA (USSR)
Seiches in the Baltic Sea and Their Effect on Floods in the Neva River Delta,
W79-02213 2L

NEW JERSEY
Storm Derived Losses of Phosphorus and their Significance to Annual Phosphorus Export from Two New Jersey Watersheds,
W79-02151 5B

The Effects of Storm Events on the Annual Phosphorus Transport in Six-Mile Run,
W79-02153 5B

NEW YORK
A Contribution to the Lake Pleistocene Stratigraphy of the Susquehanna River Valley of New York,
W79-02135 2J

Distribution of Surficial Sediments and Eelgrass in New York's South Shore Bays: An Assessment from the Literature,
W79-02162 2L

NIGERIA
Overseas Markets for the Water Industry - Nigeria,
W79-02030 5G

NITRATES
Effects of Nitrate Concentration on the Growth and Physiology of Lominaria Saccharina (Phaeophyta) in Culture,
W79-02010 5C

Disappearance of Nitrate Under Transient Conditions in Columns of Soil,
W79-02122 2G

Blooms of Surf-Zone Diatoms Along the Coast of the Olympic Peninsula, Washington, IX. Fac-

tors Controlling the Seasonal Cycle of Nitrate in the Surf at Copalis Beach (1971 through 1975), W79-02244 5C

Residual Forms of Fertilizer Nitrogen in Field Soils, W79-02364 2K

Reduction of Nitrate in a Soil Column During Continuous Flow, W79-02366 2G

Nitrate Reduction by Denitrifying Bacteria in Single and Two Stage Continuous Flow Reactors, W79-02406 5D

Effect of Dissolved Oxygen and Redox Potential and Nitrate Removal in Flooded Swamp and Marsh Soils, W79-02426 5C

The Nutrient Contents of North Sea Water: Changes in Recent Years, Particularly in the Southern Bight, W79-02468 5B

NITRIFICATION

Significance of Nitrification in Stream Analysis-Effects on the Oxygen Balance, W79-02001 5C

NITROGEN

A Survey of Phosphorus and Nitrogen Levels in Treated Municipal Wastewater, W79-02003 5A

Ammonium Oxidation and its Significance in the Summer Cycling of Nitrogen in Oxygen Depleted Skan Bay, Unalaska Islanda, Alaska, W79-02004 5C

The Occurrence and Removal of Nitrogen in Subsurface Agricultural Drainage from the San Joaquin Valley, California, W79-02107 5G

Apparent Use of Sediment Nitrogen and Phorphorus by Plants in Malletts Creek Marsh with Implications to Lake Champlain Water Level Regulation, W79-02115 2H

The Uptake, Retention, and Release of Ammonium by Reef Corals, W79-02228 5C

Nutrient and Particulate Fluxes in a Salt Marsh Ecosystem: Tidal Exchanges and Inputs by Precipitation and Groundwater, W79-02235 5C

A Computer Simulation of Phosphate and Nitrogen Transport by Water Runoff, W79-02251 5B

Residual Forms of Fertilizer Nitrogen in Field Soils, W79-02364 2K

NITROGEN COMPOUNDS

Influence of Water Soluble Excreta on Oxygen Consumption of Tilapia Zillii, W79-02462 5C

NITROGEN CYCLE

A Budget of Nitrogen Recycling in North Sea Sediments off the Belgian Coast, W79-02245 5C

NITROGEN FIXING BACTERIA

Significance of Nitrification in Stream Analysis-Effects on the Oxygen Balance, W79-02001 5C

NON-DEGRADABLE COMPOUNDS

A Method of Predicting the Biological Effects of Synthetic Pollutants in the North Sea, W79-02470 5C

NON-STRUCTURAL ALTERNATIVES

A Non-Linear Programming Approach to Floodplain Management with Non-Structural Alternatives, W79-02400 6F

NONPENETRATING WELLS

Transient Spherical Flow to a Nonpenetrating Well with Constant Drawdown, W79-02191 4B

NONPOINT POLLUTION

Best Management Practices to Control Nonpoint-Source Pollution from Agriculture, W79-02233 5G

NONPOINT WATER POLLUTION SOURCES

A Systematic Procedure for Taxing Agricultural Pollution Sources, W79-02219 5G

NONRENEWABLE RESOURCES

The Long-Run Movement of the Prices of Exhaustible Resources, W79-02026 6C

Costly Innovation and Natural Resources, W79-02062 6B

Some Extensions of the Economic Theory of Exhaustible Resources, W79-02064 6B

NORTH AMERICA

The Distribution of Juncus Roemerianus in the Salt Marshes of North America, W79-02093 2L

NORTH DAKOTA

Diurnal Use of Small Wetlands by Ducks, W79-02418 2I

NORTH SEA

A Budget of Nitrogen Recycling in North Sea Sediments off the Belgian Coast, W79-02245 5C

Net-And Nanoplankton: Effects of an Oil Spill in the North Sea, W79-02467 5C

The Nutrient Contents of North Sea Water: Changes in Recent Years, Particularly in the Southern Bight, W79-02468 5B

A Model of the Biological Effects of Eutrophication in the North Sea, W79-02469 5C

A Method of Predicting the Biological Effects of Synthetic Pollutants in the North Sea, W79-02470 5C

NORWAY

Organchlorines in Codfish from Harbours Along the Norwegian Coast, W79-02479 5C

NUISANCE ALGAE

The Role of Silica and the Vernal Diatom Bloom in Controlling the Growth of Nuisance Algal Populations in Lakes, W79-02152 5C

NUTRIENT BUDGETS

A Budget of Nitrogen Recycling in North Sea Sediments off the Belgian Coast, W79-02245 5C

NUTRIENT CYCLING

Nutrients in Subsurface and Runoff Waters of the Holland Marsh, Ontario, W79-02428 5C

NUTRIENT FLUX

Nutrient and Particulate Fluxes in a Salt Marsh Ecosystem: Tidal Exchanges and Inputs by Precipitation and Groundwater, W79-02235 5C

NUTRIENT REMOVAL

Storm Derived Losses of Phosphorus and their Significance to Annual Phosphorus Export from Two New Jersey Watersheds, W79-02151 5B

Interstital Water Chemistry of Anoxic Long Island Sound Sediments. 2. Nutrient Regeneration and Phosphate Removal, W79-02243 5C

Treatment of High Strength Meatpacking Plant Wastewater by Land Application, W79-02301 5D

Effect of Dissolved Oxygen and Redox Potential and Nitrate Removal in Flooded Swamp and Marsh Soils, W79-02426 5C

NUTRIENT REQUIREMENTS

Winery Wastewater Characteristics and Treatment, W79-02297 5D

NUTRIENTS

Effects of Nitrate Concentration on the Growth and Physiology of Lominaria Saccharina (Phaeophyta) in Culture, W79-02010 5C

Ammonium Effects on Nutrient Cation Absorption by Wheat, W79-02021 3F

You Can Tailor Effluent BOD to Fit the Receiving-Water Ecosystem...and Enhance the Environment. Urban and Fish-Processing Wastes in the Marine Environment: Bioenhancement Studies at Terminal Island, California, W79-02164 5E

Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay, W79-02223 5C

Kinetics of Algal Transient Phosphate Uptake and the Cell Quota Concept, W79-02237 5C

Cypress Wetlands for Water Management, Recycling and Conservation (Third Annual Report, November 1, 1975 to December 15, 1976), W79-02256 2I

Denitrification and Surface Runoff in the Experimental Domes: Cypress Wetlands, W79-02270 5C

Rates of Growth and Nutrient Concentrations of Trees in Cypress Domes, W79-02271 5C

Ability of Salt Marshes to Remove Nutrients and Heavy Metals from Dredged Material Disposa Area Effluents, W79-02347 5E

The Nutrient Contents of North Sea Water: Changes in Recent Years, Particularly in the Southern Bight, W79-02468 5B

A Model of the Biological Effects of Eutrophication in the North Sea,
W79-02469 5C

Fish Farms are Having to Watch Their Waste.
W79-02474 5G

OBSTACLES TO MODELING
Planning and Modeling in Urban Water Management,
W79-02288 6B

OCEANS
Seiches in the Baltic Sea and Their Effect on Floods in the Neva River Delta,
W79-02213 2L

Quantitative Mapping by Remote Sensing of an Ocean Acid-Waste Dump,
W79-02407 5A

OHIO
Limnology of Selected Lakes in Ohio - 1975,
W79-02126 2H

Chemical Characterization of Local and Stratospheric Plutonium in Ohio Soils,
W79-02320 5A

Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix A: Planktonic Communities, Benthic Assemblages, and Fishery,
W79-02346 5E

OIL
The Effects of Petroleum on the Salt Marsh Ecosystem,
W79-02485 5C

OIL FIELDS
Origins of Water and Solutes in the Geopressured Zones of the Northern Gulf of Mexico Basin,
W79-02131 2K

OIL INDUSTRY
The Price of Natural Resources,
W79-02045 6C

Underground Injection Control Program Studied,
W79-02184 5G

Planning for Offshore Oil Development. Gulf of Alaska OCS Handbook,
W79-02198 5G

OIL POLLUTION
Oil Sorbing Mat,
W79-02309 5G

Oil Salvager,
W79-02315 5G

Compositions and Processes for the Dispersing of Oil Spillages,
W79-02325 5G

Filration System,
W79-02332 5D

Gravitational Separator for Mixtures of Immiscible Liquids of Different Densities,
W79-02336 5D

Device for the Removal of a Liquid Layer on Water,
W79-02337 5G

Apparatus for Collecting Effluent Oil,
W79-02339 5G

OIL RESERVOIRS
Improved Techniques for Evaluating Carbonate Waterfloods in West Texas,
W79-02182 4B

OIL SHALES
Establishment of Native Plants for the Rehabilitation of Paraho Processed Oil Shale in an Arid Environment,
W79-02391 4A

Analysis of the Environmental Control Technology for Oil Shale Development,
W79-02432 5G

OIL SPILLS
Oil Sorbing Mat,
W79-02309 5G

Oil Salvager,
W79-02315 5G

Compositions and Processes for the Dispersing of Oil Spillages,
W79-02325 5G

Apparatus for Collecting Effluent Oil,
W79-02339 5G

Net-And Nanoplankton: Effects of an Oil Spill in the North Sea,
W79-02467 5C

The Urquiola Oil Spill, La Coruna, Spain: Impact and Reaction on Beaches and Rocky Coasts,
W79-02500 5C

OIL WASTES
Assessment of Hazardous Waste Practices in the Petroleum Refining Industry,
W79-02440 5D

OIL WELLS
Effect of Barite (BASO4) on Development of Estuarine Communities,
W79-02484 5C

OLIGOTROPHY
Maximum Depth Inhabited by Aquatic Vascular Plants,
W79-02249 5C

ON-SITE INVESTIGATIONS
Procedure for the Evaluation of Environmental Monitoring Laboratories,
W79-02149 5A

ONTARIO
Water Level Fluctuation in a Northeastern Ontario Peatland,
W79-02105 2H

OPERATION AND MAINTENANCE
Operation of the (Effluent) Purification Equipment at the Razlog Pulp and Paper Mill (Opit ot rabota na prechisvatelnata stantsiya kem KTsKh Razlog),
W79-02367 5D

OPTIMAL COOLING SYSTEMS
Optimal Configuration of the Cooling System for Power Generation,
W79-02081 5G

OPTIMIZATION
Growth and Optimal Growth with Renewable and Non Renewable Natural Resources,
W79-02032 6A

On the Optimal Policy for Exploiting Renewable Resource Stocks,
W79-02040 6B

Optimal and Competitive Use of Replenishable Natural Resources by Open Economies.
W79-02058 6C

Optimal Utilization and the Control of Fisheries,
W79-02065 6B

Optimization and Suboptimization in Fishery Regulation,
W79-02066 6B

Optimization and Suboptimization in Fishery Regulation: Comment,
W79-02067 6B

ORCHARDS
Drip Study Shows up to 30% Water Savings,
W79-02090 3F

ORGANIC COMPOUNDS
Partial Characterization of Chlorinated Organics in Superchlorinated Septages and Mixed Sludges,
W79-02413 5D

ORGANIC MATTER
Nutrient and Particulate Fluxes in a Salt Marsh Ecosystem: Tidal Exchanges and Inputs by Precipitation and Groundwater,
W79-02235 5C

The Uptake of Dissolved Organic Matter by a Small Spring Stream,
W79-02248 5C

Particulate and Dissolved Organic Matter in a Small Partly Forested Ontario Stream,
W79-02252 5C

Differential Effect of Bermuda and Bahiagrasses on Soil Chemical Characteristics,
W79-02381 3F

ORGANOCHLORINES
Further Data on Heavy Metals and Organochlorines in Marine Mammals from German Coastal Waters,
W79-02460 5B

Organchlorines in Codfish from Harbours Along the Norwegian Coast,
W79-02479 5C

ORGANOMETALLICS
Atomic Absorption Detector for Chromium Organometallic Compounds Separated by High Speed Liquid Chromatography,
W79-02080 5A

OSCILLAXANTHIN
Specific Blue-Green Algal Carotenoids in Sediments of Esthwaite Water,
W79-02246 5C

OSMOREGULATION
The Influence of Salinity and Temperature on Growth, Metabolism and Lethal Temperature of the Sand Goby, Pomatoschistus Microps K. (Der Einfluss Von Salzgehalt und Temperatur Auf Wachstum Stoffwechsel und Letaltemperatur Der Strandgrundel Pomatoschistus Microps K.),
W79-02466 5C

OSMOSIS
Evaluation of Semipermeable Membranes for Concentration or Organic Contaminants in Drinking Water,
W79-02405 5A

OSMOTIC PRESSURE
Evaluation of Semipermeable Membranes for Concentration or Organic Contaminants in Drinking Water,
W79-02405 5A

OUTER CONTINENTAL SHELF
Planning for Offshore Oil Development. Gulf of Alaska OCS Handbook,
W79-02198 5C

OVERDRAFT
Ground Water...California's Priceless Resource
W79-02392 4B

OVERFLOW
Handling and Disposal of Sludges from Combined Sewer Overflow Treatment. Phase II - Impact Assessment,
W79-02303 5D

OVERWINTERING SITES
Telemetric Determination of Salmonid Winter Micro-Habitat Occupation and Movement in Ice-Covered Streams,
W79-02157 7B

OXIDATION
Ammonium Oxidation and its Significance in the Summer Cycling of Nitrogen in Oxygen Depleted Skan Bay, Unalaska Islanda, Alaska,
W79-02004 5C

Oxygen Transfer at Hydraulic Structures,
W79-02202 5G

Ozone Treatment of Cyanide-Bearing Plating Waste,
W79-02299 5D

Purification of Kraft Pulping Effluents by Electrochemical Oxidation (Ochistka stokov sul'fatno-tsellyuloznogo proizvodstva elektrokhimicheskim okisleniem),
W79-02380 5D

OXIDATION-REDUCTION POTENTIAL
Redox Potential Measurements as an Indication of Biochemical Well Plugging,
W79-02170 5A

Effect of Dissolved Oxygen and Redox Potential and Nitrate Removal in Flooded Swamp and Marsh Soils,
W79-02426 5C

OXYGEN DEMAND
Influence of Water Soluble Excreta on Oxygen Consumption of Tilapia Zillii,
W79-02462 5C

OXYGEN DEPLETION
Ammonium Oxidation and its Significance in the Summer Cycling of Nitrogen in Oxygen Depleted Skan Bay, Unalaska Islanda, Alaska,
W79-02004 5C

OXYGENATION
Studies on the Effects of the Environment on the Heart Rate of Shellfishes. II. Effects of Temperature, Low Salinity and Hypoxia on the Heart Rate of an Abalone Haliotis (Nordotis) Discus Hannai Ino. (In Japanese),
W79-02497 5C

OZONE
Ozone Treatment of Cyanide-Bearing Plating Waste,
W79-02299 5D

P-32 UPTAKE
P-32 Uptake in Lentic Algae,
W79-02078 5C

PACKER TESTS
A Note on Packer, Slug, and Recovery Tests in Unconfined Aquifers,
W79-02179 8G

PALEOHYDROLOGY
A Hydraulic Installation in the Water Supply System of Emmaus-Nicopolis,
W79-02394 4A

The Water Supply System of Caesarea Maritima,
W79-02399 8B

PALEOLIMNOLOGY
A Paleolimnological Comparison of Burntside and Shagawa Lakes, Northeastern Minnesota,
W79-02295 5C

PARATHION
Insecticide Persistence in Natural Seawater as Affected by Salinity, Temperature, and Sterility,
W79-02487 5B

PARTICLE SIZE
Gradient, Discharge, and Particle-Size Relations of Alluvial Channels in Kansas, With Observations on Braiding,
W79-02120 2J

A Contribution to the Lake Pleistocene Stratigraphy of the Susquehanna River Valley of New York,
W79-02135 2J

Particulate and Dissolved Organic Matter in a Small Partly Forested Ontario Stream,
W79-02252 5C

Splash and Discontinuous Runoff as Creators of Fine Sandy Lag Deposits with Kalahari Sands,
W79-02393 2J

PARTICLES
Particulate and Dissolved Organic Matter in a Small Partly Forested Ontario Stream,
W79-02252 5C

PARTICULATES
Nutrient and Particulate Fluxes in a Salt Marsh Ecosystem: Tidal Exchanges and Inputs by Precipitation and Groundwater,
W79-02235 5C

PASTURES
Range Cattle Impacts on Stream Water Quality in the Colorado Front Range,
W79-02386 5G

PATCHINESS
A Pattern Analysis of Clear Lake Phytoplankton,
W79-02227 5C

PATENTS
Full-Season Rain Gauge Having Replaceable Charts for Making Profile Graphs,
W79-02304 7B

Method and Apparatus for Removing Grit,
W79-02305 5D

Drive Device for Rake Arm with Attached Screen Comb in Cleaning Device for a Water Conduit Screen,
W79-02306 8C

Method of and Apparatus for Purifying Fluids with Radioactive Impurities,
W79-02307 5D

Water Purifier,
W79-02308 5F

Oil Sorbing Mat,
W79-02309 5G

Continuous Treatment of Liquid Effluent and Sewage,
W79-02310 5D

Separation of an Aqueous or Water-Miscible Liquid from a Fluid Mixture,
W79-02311 5D

Method of Clarifying Industrial Waste Water,
W79-02312 5D

Process for Reducing the Mercury Content of Industrial Waste Waters,
W79-02313 5D

Oil Salvager,
W79-02315 5G

Device for Measuring pH and Temperature of a Liquid, Which Includes a Memory,
W79-02316 5A

Fresh Water Supply and Waste Water Retention System,
W79-02317 5G

Reciprocable Sprinkler,
W79-02318 3F

Home Water Distiller,
W79-02319 5F

Method for Treating a Medium Containing Water with Coagulants,
W79-02322 5D

Process for the Preparation of a Substantially Homogeneous Lime Water solution,
W79-02323 5D

Method of Treating a Waste Liquid Containing Polluting Compounds,
W79-02324 5D

Compositions and Processes for the Dispersing of Oil Spillages,
W79-02325 5G

Drainage Device for Particulate Material,
W79-02326 5D

Liquid Level Control System for Separation Tank,
W79-02327 5D

Apparatus for Collecting Debris Floating in a Stream,
W79-02328 5G

Reverse Osmosis Water Unit,
W79-02329 5F

Flow Monitoring,
W79-02330 8G

Polyquaternary Compounds for the Control of Microbiological Growth,
W79-02331 5D

Filration System,
W79-02332 5D

Water Treatment Apparatus and Method,
W79-02333 5F

Process for Recovering Proteinaceous Matter from Acid Whey and Tannery Unhairing Effluents,
W79-02334 5D

Novel Compositions of Matter for Use in the Treatment of Aqueous Systems,
W79-02335 5F

Gravitational Separator for Mixtures of Immiscible Liquids of Different Densities,
W79-02336 5D

Device for the Removal of a Liquid Layer on Water,
W79-02337 5G

Desalination Reverse Osmotic Membranes and Their Preparation,
W79-02338 3A

Apparatus for Collecting Effluent Oil,
W79-02339 5G

Scanning Apparatus for Septic Effluents,
W79-02340 5D

Waste Water Reclamation Apparatus,
W79-02341 5D

Grease Separator,
W79-02342 5D

Waste Fluid Treatment System,
W79-02343 5D

PATH OF POLLUTANTS
Atmospheric Formation, Dispersion, and Deposition of Acid Substances,
W79-02015 5A

Water Quality in the Old Plantation Water Control District, Broward County, Florida-Progress Report, July 1976-June 1977,
W79-02127 5B

Mass Balance Determinations for Pollutants in Urban Regions. Methodology with Applications to Lead, Zinc, Cadmium, and Arsenic.
W79-02148 5A

Storm Derived Losses of Phosphorus and their Significance to Annual Phosphorus Export from Two New Jersey Watersheds,
W79-02151 5B

The Effects of Storm Events on the Annual Phosphorus Transport in Six-Mile Run,
W79-02153 5B

Proceedings of a Workshop on the Evaluation of Models Used for the Environmental Assessment of Radionuclide Releases.
W79-02434 5B

Virus Transport Through Solid Beds,
W79-02447 5B

Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

Uptake, Retention and Loss of Cadmium by Brown Shrimp, (Crangon Crangon),
W79-02463 5B

PATTERN ANALYSIS
A Pattern Analysis of Clear Lake Phytoplankton,
W79-02227 5C

PAVING
Precipitation and Runoff Water Quality from an Urban Parking Lot and Implications for Tree Growth,
W79-02387 5B

Optimization and Testing of Highway Materials to Mitigate Ice Adhesion,
W79-02408 8G

PEAK DISCHARGE
Comparison of the Predictive Accuracy of Models of Urban Flow and Water-Quality Processes,
W79-02253 5B

PEAT
Minnesota's Peat Resources: Their Characteristics and Use in Sewage Treatment, Agriculture, and Energy,
W79-02255 5G

The Organic Sediments of Corkscrew Swamp Sanctuary,
W79-02284 2H

Hula Valley Peat: Review of Chemical and Geochemical Aspects,
W79-02365 2K

PEATLANDS
Water Level Fluctuation in a Northeastern Ontario Peatland,
W79-02105 2H

Minnesota's Peat Resources: Their Characteristics and Use in Sewage Treatment, Agriculture, and Energy,
W79-02255 5G

PENNSYLVANIA
Geology and Groundwater Resources of Northern Berks County, Pennsylvania,
W79-02132 2F

PERCHES
Studies of the Ecology of Fish Populations in the Rye Meads Sewage Effluent Lagoons,
W79-02454 5C

PERCOLATING WATER
Virus Transport Through Solid Beds,
W79-02447 5B

PERCOLATION
Virus Transport Through Solid Beds,
W79-02447 5B

PERIPHYTON
Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

PERMAFROST
Construction and Operation of Low-Pressure Dams on Permafrost Soils,
W79-02220 8D

PERMEABILITY
A Note on Packer, Slug, and Recovery Tests in Unconfined Aquifers,
W79-02179 8G

PERSONNEL MANAGEMENT
Manpower Utilization and Future Needs of Manufacturing Industries in Water Pollution Control,
W79-02438 5G

PESTICIDE REMOVAL
Treatment Effectiveness for the Removal of Selected Contaminants from Drinking Water,
W79-02435 5F

PESTICIDE RESIDUES
Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

Further Data on Heavy Metals and Organochlorines in Marine Mammals from German Coastal Waters,
W79-02460 5B

Organchlorines in Codfish from Harbours Along the Norwegian Coast,
W79-02479 5C

PESTICIDES
Wastewater Treatment Technology Documentation for Toxaphene Manufacture,
W79-02439 5D

PHENOLS
Differential Elimination of Phenol by Diatoms and Other Unicellular Algae from Low Concentrations,
W79-02486 5C

PHILIPPINES
Urban Water: Access, Delivery and Institutional Scarcity,
W79-02036 6E

PHOSPHATES
Kinetics of Phosphate Uptake by Aquatic Microorganisms: Deviations from a Simple Michaelis-Menten Equation,
W79-02016 5C

Storm Derived Losses of Phosphorus and their Significance to Annual Phosphorus Export from Two New Jersey Watersheds,
W79-02151 5B

The Effects of Storm Events on the Annual Phosphorus Transport in Six-Mile Run,
W79-02153 5B

Kinetics of Algal Transient Phosphate Uptake and the Cell Quota Concept,
W79-02237 5C

Interstital Water Chemistry of Anoxic Long Island Sound Sediments. 2. Nutrient Regeneration and Phosphate Removal,
W79-02243 5C

A Computer Simulation of Phosphate and Nitrogen Transport by Water Runoff,
W79-02251 5B

Effects of Temperature and Time on Hydroxy Aluminum Phosphate-Montmorillonite Complex,
W79-02436 2G

The Nutrient Contents of North Sea Water: Changes in Recent Years, Particularly in the Southern Bight,
W79-02468 5B

PHOSPHORUS
A Survey of Phosphorus and Nitrogen Levels in Treated Municipal Wastewater,
W79-02003 5A

Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

Apparent Use of Sediment Nitrogen and Phorphorus by Plants in Malletts Creek Marsh with Implications to Lake Champlain Water Level Regulation,
W79-02115 2H

Storm Derived Losses of Phosphorus and their Significance to Annual Phosphorus Export from Two New Jersey Watersheds,
W79-02151 5B

The Role of Silica and the Vernal Diatom Bloom in Controlling the Growth of Nuisance Algal Populations in Lakes,
W79-02152 5C

The Effects of Storm Events on the Annual Phosphorus Transport in Six-Mile Run,
W79-02153 5B

The Distribution and Form of Phosphorus in North Atlantic Ocean Deep-Sea and Continental Slope Sediments,
W79-02230 5B

Dependence of Light-Saturated Rates of Algal Photosynthesis on Intracellular Concentrations of Phosphorus,
W79-02236 5C

An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships of Lakes,
W79-02247 5C

Uptake and Distribution of Phosphorus in the Understory of Cypress Domes,
W79-02264 5C

A Model of the Biological Effects of Eutrophication in the North Sea,
W79-02469 5C

PHOSPHROUS
A Dynamic Lake Model for Trophic State Prediction,
W79-02006 5C

PHOTOSYNTHESIS
Photosynthetic Rates of Marine Algae as a Function of Inorganic Carbon Concentration,
W79-02224 5C

Dependence of Light-Saturated Rates of Algal Photosynthesis on Intracellular Concentrations of Phosphorus,
W79-02236 5C

Comparative Studies of Cypress Ecosystems,
W79-02277 2H

Physiological Aspects of Water Use Efficiency,
W79-02449 2I

Net-And Nanoplankton: Effects of an Oil Spill in the North Sea,
W79-02467 5C

Effect of Hexachlorobenzene (HCB) on Photosynthetic Oxygen Evolution and Respiration of Chlorella Pyrenoidosa,
W79-02480 5C

PHREATOPHYTES
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

PHYTOPLANKTON
A Simulation Model for Phytoplankton Growth and Nutrient Cycling in Eutrophic, Shallow Lakes,
W79-02008 5C

Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

Photosynthetic Rates of Marine Algae as a Function of Inorganic Carbon Concentration,
W79-02224 5C

Simulation Model of Cryptomonas Ovata Population Dynamics in Southern Kootenay Lake, British Columbia,
W79-02225 5C

A Pattern Analysis of Clear Lake Phytoplankton,
W79-02227 5C

Release of Dissolved Organic Carbon by Grazing Zooplankton,
W79-02234 5C

Dependence of Light-Saturated Rates of Algal Photosynthesis on Intracellular Concentrations of Phosphorus,
W79-02236 5C

Kinetics of Algal Transient Phosphate Uptake and the Cell Quota Concept,
W79-02237 5C

Use of Fluorescence Microscopy for Quantifying Phytoplankton, Especially Filamentous Blue-Green Algae,
W79-02239 5C

Recent Changes in Plankton Communities and Present Trophic State of Lake Steinsfjord,
W79-02250 5C

PIGMENTS
Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay,
W79-02223 5C

Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

Specific Blue-Green Algal Carotenoids in Sediments of Esthwaite Water,
W79-02246 5C

PILOT PLANTS
Winery Wastewater Characteristics and Treatment,
W79-02297 5D

PINE TREES
Effect of Sewage Effluent in Cypress Ponds on Growth of Surrounding Pine Seedlings and Trees,
W79-02274 5C

PINEY POINT AQUIFER (MD)
Two Drilling Methods Compared,
W79-02169 8B

PIRQUE VALLEY (CHILE)
Water Utilization and Reallocation in Chile: A Study of the Pirque Valley,
W79-02053 6B

PISCICIDES
Effect of Antimycin on Stream Insects in Field and Laboratory Trials,
W79-02156 5C

PLANKTIVORES
Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

PLANKTON
Organism Patchiness in Lakes Resulting from the Interaction Between the Internal Seiche and Planktonic Diurnal Vertical Migration,
W79-02009 5C

Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix A: Planktonic Communities, Benthic Assemblages, and Fishery,
W79-02346 5E

Influence of Silver Carp (Hypophtalmichthys Molitrix) on Plankton of Shallow Waters According to Investigations in Carp Ponds (Wirkungen Von Silberkarpfen (Hypophthalmichtmys Molitrix) Auf Das Plankton in Flachcewassern Nach Untersuchungen in Karpfenteichen),
W79-02457 5C

The Crustacean Zooplankton of Grasmere Before and After a Change in Sewage Effluent Treatment,
W79-02458 5C

PLANNING
Quantification, Decision-Making and Environmental Impact Assessment in the United Kingdom.
W79-02028 6G

Coordinating Public Utility Expansion, Industrial Siting and Pollution Control: A Working Dynamic Programming Algorithm,
W79-02039 5G

Issues in Water Development Decisions: A Discussion Paper,
W79-02042 6B

Forested Wetlands of Florida-Their Management and Use,
W79-02112 6B

Geographic Aspects of the Territorial Redistribution of Water Resources,
W79-02209 4A

Profile and Measurement of Social Well-Being Indicators for Use in the Evaluation of Water and Related Land Management Planning,
W79-02344 6B

PLANT BIOCHEMISTRY
Ethylmercury: Formation in Plant Tissues and Relation to Methylmercury Formation,
W79-02488 5A

PLANT ECOLOGY
The Autecology of Sawgrass in the Florida Everglades,
W79-02104 2L

PLANT GROWTH
Effects of Nitrate Concentration on the Growth and Physiology of Lominaria Saccharina (Phaeophyta) in Culture,
W79-02010 5C

The Nature of Growth Forms in the Salt Marsh Grass Spartina Alterniflora,
W79-02087 2L

Dependence of Light-Saturated Rates of Algal Photosynthesis on Intracellular Concentrations of Phosphorus,
W79-02236 5C

Rates of Growth and Nutrient Concentrations of Trees in Cypress Domes,
W79-02271 5C

Growth Rates of Seedlings Planted in Cypress Domes,
W79-02272 5C

Effect of Sewage Effluent in Cypress Ponds on Surrounding Soil Moisture and Nutrient Content and on Growth of Pine Trees (Summary of MS Thesis),
W79-02273 5C

Effect of Sewage Effluent in Cypress Ponds on Growth of Surrounding Pine Seedlings and Trees,
W79-02274 5C

PLANT GROWTH SUBSTANCES
Growth-Influencing Substances in Sediment Extracts from a Subtropical Wetland: Investigation Using a Diatom Bioassay,
W79-02476 5C

PLANT MORPHOLOGY
Biochemical and Transpiration Studies of the Growth Form of Spartina Alterniflora on Connecticut Salt Marshes,
W79-02101 2I

PLANT PHYSIOLOGY
Effects of Nitrate Concentration on the Growth and Physiology of Lominaria Saccharina (Phaeophyta) in Culture,
W79-02010 5C

Physiological Aspects of Water Use Efficiency,
W79-02449 2I

Ethylmercury: Formation in Plant Tissues and Relation to Methylmercury Formation,
W79-02488 5A

PLANT POPULATIONS
The Vegetation of Southern Florida,
W79-02425 2I

PLANTATION CANAL (VA)
Water Quality in the Old Plantation Water Control District, Broward County, Florida-Progress Report, July 1976-June 1977,
W79-02127 5B

PLASTIC PIPES
Drillers Find Increasing Use for Plastic Pipe,
W79-02177 8G

PLEISTOCENE EPOCH
Hula Valley Peat: Review of Chemical and Geochemical Aspects,
W79-02365 2K

PLUTONIUM
Anion Exchange Method for the Determination of Plutonium in Water: Single-Laboratory Evaluation and Interlaboratory Collaborative Study,
W79-02145 5A

Chemical Characterization of Local and Stratospheric Plutonium in Ohio Soils,
W79-02320 5A

PODZOLS
The Behavio of Sulfate on Salt Input in Podzolic Brown Earth,
W79-02321 2K

POISSON-BOLTZMANN EQUATION
Application of the Electrical Double Layer Theory to Predict Ion Absorption in Mixed Ionic Systems,
W79-02314 2K

POLECAT BAY (ALA)
Perimeter Dike Raising with Dewatered Fine-Grained Dredged Material at Upper Polecat Bay Disposal Area, Mobile, Alabama,
W79-02345 5E

POLICY
A Simulation Model for Resource Policy Evaluation,
W79-02025 6A

On the Optimal Policy for Exploiting Renewable Resource Stocks,
W79-02040 6B

POLIOVIRUS TYPE I
Adsorption of Poliovirus Type I to Wastewater Treatment Plant Solids,
W79-02446 5D

POLITICAL ASPECTS
Nine Fallacies of Natural Disaster: The Case of the Sahel,
W79-02398 6B

POLITICAL CONSTRAINTS
The Price of Natural Resources,
W79-02045 6C

POLLUTANT IDENTIFICATION
Measurement of Chelating Agent Levels in Media with High Concentrations of Interfering Metal Ions,
W79-02079 5A

Atomic Absorption Detector for Chromium Organometallic Compounds Separated by High Speed Liquid Chromatography,
W79-02080 5A

Anion Exchange Method for the Determination of Plutonium in Water: Single-Laboratory Evaluation and Interlaboratory Collaborative Study,
W79-02145 5A

Mass Balance Determinations for Pollutants in Urban Regions. Methodology with Applications to Lead, Zinc, Cadmium, and Arsenic.
W79-02148 5A

Considerations in Conducting Bioassays,
W79-02349 5A

Evaluation of Semipermeable Membranes for Concentration or Organic Contaminants in Drinking Water,
W79-02405 5A

Comparison of Methods for the Determination of Total Available Residual Chlorine in Various Sample Matrices,
W79-02412 5A

Investigation of the Microflora of Swamp Ore and Lake Water by the Method of Electron Microscopy, (In German),
W79-02423 5A

Asbestos in the Water Supplies of the Ten Regional Cities, Part I,
W79-02441 5A

POLLUTANTS
Intertidal Environment of Northern Dublin Bay,
W79-02204 5B

Ability of Salt Marshes to Remove Nutrients and Heavy Metals from Dredged Material Disposa Area Effluents,
W79-02347 5E

Aquatic Disposal Field Investigations Duwamish Waterway Disposal Site Puget Sound, Washington, Evaluative Summary,
W79-02350 5C

POLLUTION ABATEMENT
Coefficients of Pollution: Interindustry Linkage and Pollution in Belgium,
W79-02031 5G

The Choice of Efficient Pollution Policies: Technology and Economics in the Control of Sulphur Dioxide,
W79-02038 5G

Coordinating Public Utility Expansion, Industrial Siting and Pollution Control: A Working Dynamic Programming Algorithm,
W79-02039 5G

The Limited Applicability of Marshallian Economics to the Problem of Pollution Abatement: A Suggested Alternative,
W79-02041 5G

The Business of Pollution Control - A Bed of Roses or Thorns.
W79-02044 5G

Econometric Analysis of Environmental Policy: Estimation of a Model of the Canadian Pulp and Paper Industry,
W79-02046 6B

Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

Natural Resources and Environmental Restrictions to Growth,
W79-02056 6G

A Polluted Golden Age,
W79-02071 5G

Proceedings of the Interstate Seafood Seminar October 4-7, 1977.
W79-02163 5G

Advances in Storm and Combined Sewer Pollution Control Abatement Technology,
W79-02437 5D

POLLUTION COEFFICIENTS
Coefficients of Pollution: Interindustry Linkage and Pollution in Belgium,
W79-02031 5G

POLLUTION CONTROL DEVICES
Research on Control Technology for Ice Fog From Mobile Sources,
W79-02147 5G

POLLUTION TAXES (CHARGES)
The Choice of Efficient Pollution Policies: Technology and Economics in the Control of Sulphur Dioxide,
W79-02038 5G

The Limited Applicability of Marshallian Economics to the Problem of Pollution Abatement: A Suggested Alternative,
W79-02041 5G

Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

Pricing and Standards in the Control of Pollution,
W79-02057 5G

A Systematic Procedure for Taxing Agricultural Pollution Sources,
W79-02219 5G

POLYCHLORINATED BIPHENYLS
A Material Balance Study of Polychlorinated Biphenyls in Lake Michigan,
W79-02017 5C

Polychlorinated Biphenyls in Coastal Marine Zooplankton: Bioaccumulation by Equilibrium Partitioning,
W79-02242 5C

Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

A Method of Predicting the Biological Effects of Synthetic Pollutants in the North Sea,
W79-02470 5C

Organchlorines in Codfish from Harbours Along the Norwegian Coast,
W79-02479 5C

POLYMERS
New Membranes for Treating Metal Finishing Effluents by Reverse Osmosis,
W79-02300 5D

PONDEROSA PINE FORESTS
Water Quality of Streamflow from Forested Watersheds on Sedimentary Soils,
W79-02404 5B

POPULATION DYNAMICS
Simulation Model of Cryptomonas Ovata Population Dynamics in Southern Kootenay Lake, British Columbia,
W79-02225 5C

POROUS MEDIA
Streaming-Potential Effects in Saturated Water Flow Through a Sand-Kaolinite Mixture,
W79-02160 2G

Electrical Potentials During Water Entry into an Air-Dry Mixture of Sand and Kaolinite,
W79-02357 2G

POTABLE WATER
Treatment Effectiveness for the Removal of Selected Contaminants from Drinking Water,
W79-02435 5F

POTAMOGETON RICHARDSONII
Seasonal Changes in the Epiphyte Community of Natural and Artificial Macrophytes in Lake Memphremagog (QUE. and VT.),
W79-02232 5C

POWER GENERATION
Optimal Configuration of the Cooling System for Power Generation,
W79-02081 5G

POWER PLANTS
Is It Time to Do a Benefit-Cost Analysis for the Location of a Power Plant,
W79-02054 6B

PRECIPITATION (ATMOSPHERIC)
Drought in the Upper Midwest, 1931-1969,
W79-02196 2B

Precipitation and Runoff Water Quality from an Urban Parking Lot and Implications for Tree Growth,
W79-02387 5B

PREDATION
Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

Application of a Model of Zooplankton Composition to Problems of Fish Introductions to the Great Lakes,
W79-02020 5C

Food Habits of Coastal Marsh Raccoons with Observations of Alligator Nest Predation,
W79-02117 2L

PRICES
The Long-Run Movement of the Prices of Exhaustible Resources,
W79-02026 6C

The Price of Natural Resources,
W79-02045 6C

PRICING
Pricing and Standards in the Control of Pollution,
W79-02057 5G

PRIESTLEY-TAYLOR EVAPORATION FORMULA
Advection Modification of the Priestley and Taylor Evapotranspiration Formula,
W79-02395 2D

PRIMARY PRODUCTIVITY
A Dynamic Lake Model for Trophic State Prediction,
W79-02006 5C

Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

Geographic Variations in Salt Marsh Macrophyte Productions: A Review,
W79-02098 2H

Root Production and Root Turnover in a Wet Tundra Ecosystem, Barrow, Alaska,
W79-02100 2I

Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-02103 5C

Production of Submerged Aquatic Plant Communities of Doodhadhari Lake Raipur, (M. P. India),
W79-02419 2I

Eco-Biochemical Studies on Some Economically Important Intertidal Algae from Port Okha (India),
W79-02475 5C

PRODUCTION FUNCTIONS
Mathematical Models of a Fishery,
W79-02069 6B

PRODUCTIVITY
Angiosperm Production of Three Virginia Marshes in Various Salinity and Soil Nutrient Regimes,
W79-02108 2L

Cypress Wetlands for Water Management, Recycling and Conservation (Third Annual Report, November 1, 1975 to December 15, 1976),
W79-02256 2I

Litterfall and Litter Decomposition in Four Cypress Domes,
W79-02265 2I

Comparative Studies of Cypress Ecosystems,
W79-02277 2H

Influence of Silver Carp (Hypophtalmichthys Molitrix) on Plankton of Shallow Waters According to Investigations in Carp Ponds (Wirkungen Von Silberkarpfen (Hypophthalmichtmys Molitrix) Auf Das Plankton in Flachcewassern Nach Untersuchungen in Karpfenteichen),
W79-02457 5C

PROFESSIONAL PERSONNEL
The Need for Professionalism and its Attributes in Hydrogeology,
W79-02174 6E

PROJECTED PLANNING
Manpower Utilization and Future Needs of Manufacturing Industries in Water Pollution Control,
W79-02438 5G

PROTECTION
An Examination of Legislation for the Protection of the Wetlands of the Atlantic and Gulf Coast States,
W79-02106 6E

Tire Module Systems in Shore and Harbor Protection,
W79-02201 8G

PROTEIN
Eco-Biochemical Studies on Some Economically Important Intertidal Algae from Port Okha (India),
W79-02475 5C

PROTEINS
Protein Production Rates by Algae Using Swine Manure as a Substrate,
W79-02489 5D

PROTOZOA
Effects of Ingesting Mercury-Containing Bacteria on Mercury Tolerance and Growth Rates of Ciliates,
W79-02499 5C

PSYCHOLOGICAL ASPECTS
Nine Fallacies of Natural Disaster: The Case of the Sahel,
W79-02398 6B

PUBLIC ACCESS
Urban Water: Access, Delivery and Institutional Scarcity,
W79-02036 6E

PUBLIC HEALTH
Bioaccumulation Potential and Acute Toxicity of Synthetic Fuels Effluents in Freshwater Biota: Azaarenes,
W79-02241 5C

Proceedings of a Workshop on the Evaluation of Models Used for the Environmental Assessment of Radionuclide Releases.
W79-02434 5B

Hazardous Waste Disposal Damage Reports, Document No 2.
W79-02443 5E

PUBLIC UTILITIES
Structuring Water Utility Bond Issues to Cope with Inflation,
W79-02024 6C

Coordinating Public Utility Expansion, Industrial Siting and Pollution Control: A Working Dynamic Programming Algorithm,
W79-02039 5G

PUERTO RICO
Estimates of 7-Day, 10-Year Minimum Flows at Selected Stream Sites in Puerto Rico,
W79-02125 5B

PUGET SOUND (WA)
Polychlorinated Biphenyls in Coastal Marine Zooplankton: Bioaccumulation by Equilibrium Partitioning,
W79-02242 5C

PUGET SOUND (WASH)
Aquatic Disposal Field Investigations Duwamish Waterway Disposal Site Puget Sound, Washington, Evaluative Summary,
W79-02350 5C

PULP AND PAPER INDUSTRY
Natural Resources and Regional Disparities: A Skeptical View,
W79-02034 6B

Econometric Analysis of Environmental Policy: Estimation of a Model of the Canadian Pulp and Paper Industry,
W79-02046 6B

Possibilities and Measures in the Pulp Industry in the Interest of Environmental Protection (Moeglichkeiten und Massnahmen der Zellstoffindustrie im Interesse des Umweltschutzes).
W79-02369 5G

Pulp Industry and Water Pollution Control (Zellstoffindustrie und Gewaesserschutz),
W79-02370 5G

Possibilities for Reducing COD and 5-Day BOD in Waste Waters from the Pulp and Viscose Rayon Fiber Industries (Moeglichkeiten zur Reduktion des CSB und BSB(5) in den Abwaessern der Zellstoff- und Viskosefaserindustrie),
W79-02376 5D

Status and Methods for Effluent Purification in Pulp and Paper Mills (Stand und Verfahren der Restabwasserreinigung von Zellstoff- und Papierfabriken),
W79-02377 5D

PULP AND PAPER MILL SLUDGE
Bark as a Medium for Gravity Dewatering of Secondary Sludge from Pulp and Paper Mills,
W79-02186 5D

PULP WASTES
New Pulp Mill Strikes Low Profile.
W79-02102 5D

Investigations of Heat Treatment for Paper Mill Sludge Conditioning,
W79-02296 5E

Planning and Startup of a Flexible Activated Sludge Installation (Bioflex Process) as a Biological Clarification Stage in a Board Mill (Planung und Inbetriebnahme einer flexiblen Belebtschlammanlage (Bioflex-Verfahren) als biologische Klaerstufe einer Kartonfabrik),
W79-02361 5D

Screening – A Novel Approach to Primary Treatment,
W79-02363 5D

Operation of the (Effluent) Purification Equipment at the Razlog Pulp and Paper Mill (Opit ot rabota na prechisvatelnata stantsiya kem KTsKh Razlog),
W79-02367 5D

Use of the Activated Sludge Process in Purifying Waste Waters from Pulp Production, Especially Kraft Pulp Production (Anwendung des Belebtschlammverfahrens zur Reinigung von Abwaessern aus der Zellstoffproduktion, insbesondere der Sulfatzellstoffproduktion),
W79-02371 5D

Purification of Effluents of the Verkhotursk Wood Chemical Plant in Storage Ponds (Ochistka stochnykh vod Verkhoturskogo Lesokhimicheskogo Zavoda v prudu-nakopitele),
W79-02372 5D

Processing of Pulp and Paper Industry Waste by Reverse Osmosis for Pollution Control,
W79-02373 5D

Fish Test With Golden Orfe -- Testing the Toxicity of Matter Contained in Water (Fischtest mit Goldorfen -- Pruefung der Toxizitaet von Wasserinhaltsstoffen),
W79-02375 5C

Sulfate Turpentine in Unpurified and Purified Effluents from the Baikal Pulp Mill (Sul'fatnyi skipidar v neochishchennykh i ochishchennykh stokakh Baikal'skogo Tsellyuloznogo Zavoda),
W79-02378 5B

Conversion of Lignosulfonates in Natural Waters (Prevrashchenie lignosul'fonatov v prirodnykh vodakh),
W79-02379 5B

Purification of Kraft Pulping Effluents by Electrochemical Oxidation (Ochistka stokov sul'fatno-tsellyuloznogo proizvodstva elektrokhimicheskim okisleniem),
W79-02380 5D

Analyses of Paper Machine Waters with Ion Specific Electrodes. Part V. Sulfide Determination Using Ag(+) Ion Specific Electrode and Various Measurement Methods,
W79-02388 5A

PUMPING
Transient Spherical Flow to a Nonpenetrating Well with Constant Drawdown,
W79-02191 4B

PUMPS
Water Systems Basics, (1),
W79-02180 8C

RACCOON
Food Habits of Coastal Marsh Raccoons with Observations of Alligator Nest Predation,
W79-02117 2L

RADIOACTIVE WASTE DISPOSAL
A Statistical Evaluation of Some Columbia River Basalt Chemical Analysis,
W79-02433 5A

RADIOACTIVE WASTES
Method of and Apparatus for Purifying Fluids with Radioactive Impurities,
W79-02307 5D

RADIOACTIVITY EFFECTS
Proceedings of a Workshop on the Evaluation of Models Used for the Environmental Assessment of Radionuclide Releases.
W79-02434 5B

RADIONUCLIDES
Proceedings of a Workshop on the Evaluation of Models Used for the Environmental Assessment of Radionuclide Releases.
W79-02434 5B

RAIN GAGES
Full-Season Rain Gauge Having Replaceable Charts for Making Profile Graphs,
W79-02304 7B

RAIN WATER
Yield of Dryland Grain Sorghum as Affected by Antitranspirant, Nitrogen, and Contributing Micro-Watershed,
W79-02403 3F

RAINBOW TROUT
Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

RAINFALL-RUNOFF RELATIONSHIPS
Flow Characteristics of Streams in Tutuila, American Samoa,
W79-02124 2E

RANGE MANAGEMENT
Land Use and Intensive Range Management in the Sierra Nevada Foothills--A Contemporary Analysis,
W79-02293 4D

RAPIDS
Structural Control of the Rapids and Pools of the Colorado River in the Grand Canyon,
W79-02200 2E

RAYON
Possibilities for Reducing COD and 5-Day BOD in Waste Waters from the Pulp and Viscose Rayon Fiber Industries (Moeglichkeiten zur Reduktion des CSB und BSB(5) in den Abwaessern der Zellstoff- und Viskosefaserindustrie),
W79-02376 5D

RECOVERY TESTS
A Note on Packer, Slug, and Recovery Tests in Unconfined Aquifers,
W79-02179 8G

RECREATION
Consumer Surplus and Economic Rent Estimates of Recreation Value: An Empirical and Theoretical Comparison,
W79-02290 6B

RECREATION DEMAND
Consumer Surplus and Economic Rent Estimates of Recreation Value: An Empirical and Theoretical Comparison,
W79-02290 6B

RECYCLING
Dual Water Supplies: An Idea for the Future,
W79-02175 3D

Protein Production Rates by Algae Using Swine Manure as a Substrate,
W79-02489 5D

RED TIDE
Potential Importance of Benthic Cysts of Gonyaulax Tamarensis and G. Excavata Initiating Toxic Dinoflagellate Blooms,
W79-02011 5C

REGIONAL ANALYSIS
Ecosystem Analyses at Corkscrew Swamp,
W79-02282 2I

A Non-Linear Programming Approach to Floodplain Management with Non-Structural Alternatives,
W79-02400 6F

REGIONAL DEVELOPMENT
Natural Resources and Regional Disparities: A Skeptical View,
W79-02034 6B

Studying the Economics of a Waterway: A Critique of Studies of the McClellan-Kerr Arkansas River Navigation System,
W79-02052 6B

REGIONAL ECONOMICS
Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

REGIONS
Complex Relations Between the Hydrologic Budget of the Major Geographic Zones of the Earth,
W79-02208 2A

REGULATION
EPA's Construction Grants Program: Perspectives Costs,
W79-02027 5G

The Choice of Efficient Pollution Policies: Technology and Economics in the Control of Sulphur Dioxide,
W79-02038 5G

The Limited Applicability of Marshallian Economics to the Problem of Pollution Abatement: A Suggested Alternative,
W79-02041 5G

Natural Resources and Environmental Restrictions to Growth,
W79-02056 6G

Pricing and Standards in the Control of Pollution,
W79-02057 5G

Optimization and Suboptimization in Fishery Regulation,
W79-02066 6B

Optimization and Suboptimization in Fishery Regulation: Comment,
W79-02067 6B

Exploitation of Common-Property Replenishable Natural Resources,
W79-02070 6B

REINFORCED CONCRETE
Strength and Behavior of Thick Waled Reinforced Concrete Conduits,
W79-02217 8F

Design and Proof Test Requirements for Precast Reinforced Concrete Box Culverts,
W79-02218 8F

REMOTE SENSING
Remote Sensing Techniques and the Monitoring of Desertification Processes in Arid Areas,
W79-02390 7B

Quantitative Mapping by Remote Sensing of an Ocean Acid-Waste Dump,
W79-02407 5A

RENEWABLE RESOURCES
On the Optimal Policy for Exploiting Renewable Resource Stocks,
W79-02040 6B

The Economic Consequences of the 200-Mile Seabed Zone: The Replenishable Resources Case,
W79-02048 6E

Optimal and Competitive Use of Replenishable Natural Resources by Open Economies.
W79-02058 6C

Dynamic Analysis of Commercial Fishing Model,
W79-02063 6C

General Equilibrium with a Replenishable Natural Resource,
W79-02068 6B

Exploitation of Common-Property Replenishable Natural Resources,
W79-02070 6B

REPRODUCTION
Potential Importance of Benthic Cysts of Gonyaulax Tamarensis and G. Excavata Initiating Toxic Dinoflagellate Blooms,
W79-02011 5C

REPTILES
Food Habits of Coastal Marsh Raccoons with Observations of Alligator Nest Predation,
W79-02117 2L

RESEARCH AND DEVELOPMENT
The Business of Pollution Control - A Bed of Roses or Thorns.
W79-02044 5G

Storm and Combined Sewer Pollution Control Program Reports. Research, Development, and Demonstration Grant, Contract, and In-House Project Reports.
W79-02442 5G

RESERVATION DOCTRINE
Procedural Inconsistencies and Substantive Issues in the Federal Reserved Water Rights Doctrine. Case Note, United States v. Akin, 504 F.2d 115 (10th Cir. 1974),
W79-02084 6E

RESERVOIRS
Copper Sulfate Helps Control Micorganisms in Reservoirs,
W79-02018 5F

Trace Element of the Sardis Reservoir, Mississippi, as Related to Clay Mineral Dispersion,
W79-02187 2H

RESISTANCE
Effects of Ingesting Mercury-Containing Bacteria on Mercury Tolerance and Growth Rates of Ciliates,
W79-02499 5C

RESISTANCE NETWORKS
Fossil Ground-Water Gradients in Arid Regional Sedimentary Basins,
W79-02189 2F

RESOURCE ALLOCATION
Optimal and Competitive Use of Replenishable Natural Resources by Open Economies.
W79-02058 6C

Optimal Utilization and the Control of Fisheries,
W79-02065 6B

Economics of Wilderness Resources,
W79-02072 6B

RESOURCE DEPLETION
Costly Innovation and Natural Resources,
W79-02062 6B

RESOURCE DEVELOPMENT
Planning for Offshore Oil Development. Gulf of Alaska OCS Handbook,
W79-02198 5G

RESOURCE EXTRACTION
Some Extensions of the Economic Theory of Exhaustible Resources,
W79-02064 6B

RESPIRATION
New Method for Recording Heart and Respiratory Rates in Catfish,
W79-02077 7B

Influence of Water Soluble Excreta on Oxygen Consumption of Tilapia Zillii,
W79-02462 5C

Effect of Hexachlorobenzene (HCB) on Photosynthetic Oxygen Evolution and Respiration of Chlorella Pyrenoidosa,
W79-02480 5C

RETURN FLOW
Treatment of High Strength Meatpacking Plant Wastewater by Land Application,
W79-02301 5D

REVEGETATION
Establishment of Native Plants for the Rehabilitation of Paraho Processed Oil Shale in an Arid Environment,
W79-02391 4A

REVERSE OSMOSIS
New Membranes for Treating Metal Finishing Effluents by Reverse Osmosis,
W79-02300 5D

Reverse Osmosis Water Unit,
W79-02329 5F

Processing of Pulp and Paper Industry Waste by Reverse Osmosis for Pollution Control,
W79-02373 5D

Desalination in the Reuse of Industrial Waste Water,
W79-02383 5D

Evaluation of Semipermeable Membranes for Concentration or Organic Contaminants in Drinking Water,
W79-02405 5A

REVIEWS
Geographic Variations in Salt Marsh Macrophyte Productions: A Review,
W79-02098 2H

An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships of Lakes,
W79-02247 5C

RICE
Zinc Nutrition of Rice as Influenced by Rates of Gypsum and Zn Fertilizaton of Alkali Soils,
W79-02099 3F

RIPARIAN PHREATOPHYTES
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

RIPRAP
Practical Riprap Design,
W79-02351 8B

RISKS
Measurement of Economic Uncertainty in Public Water Resource Development: An Extension,
W79-02050 6B

RIVER BASIN DEVELOPMENT
Magnitude and Frequency of Flooding on the Myakka River, Southwest Florida,
W79-02129 4A

RIVER BASINS
Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

RIVER HULL (ENGLAND)
The Effects of Weed-Cutting on the Macro-Inverterate Fauna of a Canalised Section of the River Hull, A Northern English Chalk Stream,
W79-02002 5C

RIVERS
Study of River Meandering in the Search for Tectonic Structures (As Exemplified by the Middle Dniester Region),
W79-02205 8E

ROADS
Wetland Road Crossing: Drainage Problems and Timber Damage,
W79-02421 4C

ROCKY MOUNTAIN NATIONAL PARK
Disaster Response to Flash Flood,
W79-02193 8B

ROOT SYSTEMS
Root Production and Root Turnover in a Wet Tundra Ecosystem, Barrow, Alaska,
W79-02100 2I

Simulated Flow Through the Root Xylem,
W79-02199 2I

ROOTED AQUATIC PLANTS
Geographic Variations in Salt Marsh Macrophyte Productions: A Review,
W79-02098 2H

Biochemical and Transpiration Studies of the Growth Form of Spartina Alterniflora on Connecticut Salt Marshes,
W79-02101 2I

Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-02103 5C

The Autecology of Sawgrass in the Florida Everglades,
W79-02104 2L

Maximum Depth Inhabited by Aquatic Vascular Plants,
W79-02249 5C

RUBBER
Optimization and Testing of Highway Materials to Mitigate Ice Adhesion,
W79-02408 8G

RUNOFF
Role of Ground Waters in the Formation of the Total Runoff of a Small Drainage Basin in the Forest Zone,
W79-02211 4B

RURAL AREAS
Management of Rural Water Supply Peak Flow Rates,
W79-02194 3D

SAHEL
Nine Fallacies of Natural Disaster: The Case of the Sahel,
W79-02398 6B

SALINE SOILS
Sugar Cane Growth in Response to Mulch and Fertilizer on Saline-Alkali Subsoils,
W79-02029 3C

SALINE WATER
Water Quality Can Affect Management Planning,
W79-02096 5G

SALINE WATER SYSTEMS
Hypersaline Lagoonal Deposits and Processes.
W79-02430 2L

SALINITY
Alligator Diets in Relation to Marsh Salinity, W79-02118 2L

Effects of Some Environmental Factors on Growth and Food Consumption of the Baltic Palaemonid Shrimp, Palaemon Adspersus Var. Fabricii (Rathke), W79-02465 5C

The Influence of Salinity and Temperature on Growth, Metabolism and Lethal Temperature of the Sand Goby, Pomatoschistus Microps K. (Der Einfluss Von Salzgehalt und Temperatur Auf Wachstum Stoffwechsel und Letaltemperatur Der Strandgrundel Pomatoschistus Microps K.), W79-02466 5C

Studies on the Effects of the Environment on the Heart Rate of Shellfishes. II. Effects of Temperature, Low Salinity and Hypoxia on the Heart Rate of an Abalone Haliotis (Nordotis) Discus Hannai Ino. (In Japanese), W79-02497 5C

SALMONIDS
Telemetric Determination of Salmonid Winter Micro-Habitat Occupation and Movement in Ice-Covered Streams, W79-02157 7B

On the Uptake of Three Different Types of Hydrocarbons by Salmon Eggs (Salmo Salar L.), W79-02464 5C

SALT
Water Quality Can Affect Management Planning, W79-02096 5G

SALT MARSHES
Amino Acids in Salt Marsh Detritus, W79-02086 5C

The Nature of Growth Forms in the Salt Marsh Grass Spartina Alterniflora, W79-02087 2L

The Distribution of Juncus Roemerianus in the Salt Marshes of North America, W79-02093 2L

Biochemical and Transpiration Studies of the Growth Form of Spartina Alterniflora on Connecticut Salt Marshes, W79-02101 2I

Nutrient and Particulate Fluxes in a Salt Marsh Ecosystem: Tidal Exchanges and Inputs by Precipitation and Groundwater, W79-02235 5C

Ability of Salt Marshes to Remove Nutrients and Heavy Metals from Dredged Material Disposa Area Effluents, W79-02347 5E

Effects of an Organic Arsenical Herbicide on a Salt Marsh Ecosystem, W79-02427 5C

The Effects of Petroleum on the Salt Marsh Ecosystem, W79-02485 5C

SALTS
The Behavio of Sulfate on Salt Input in Podzolic Brown Earth, W79-02321 2K

SALVINIA MOLESTA
The Colonization of Cabora Bassa, Mocambique, A New Man-Made Lake, by Floating Aquatic Macrophytes, W79-02231 4A

SAMPLING
Macroinvertebrate Sampling Techniques For Streams in Semi-Arid Regions: Comparison of the Surber Method and A Unit-Effort Traveling Kick Method, W79-02146 5A

SAN BERNADINO (CALIF)
Model Aids Planners in Predicting Rising Ground-Water Levels in San Bernadino, California, W79-02173 4B

SAN JOAQUIN VALLEY (CALIF)
The Occurrence and Removal of Nitrogen in Subsurface Agricultural Drainage from the San Joaquin Valley, California, W79-02107 5G

SAND AQUIFERS
Potential for Downward Leakage to the Floridan Aquifer, Green Swamp Area, Central Florida, W79-02136 7C

SAND GOBIES
The Influence of Salinity and Temperature on Growth, Metabolism and Lethal Temperature of the Sand Goby, Pomatoschistus Microps K. (Der Einfluss Von Salzgehalt und Temperatur Auf Wachstum Stoffwechsel und Letaltemperatur Der Strandgrundel Pomatoschistus Microps K.), W79-02466 5C

SARDIS RESERVOIR (MISS)
Trace Element of the Sardis Reservoir, Mississippi, as Related to Clay Mineral Dispersion, W79-02187 2H

SATURATED FLOW
Streaming-Potential Effects in Saturated Water Flow Through a Sand-Kaolinite Mixture, W79-02160 2G

Electrical Potentials During Water Entry into an Air-Dry Mixture of Sand and Kaolinite, W79-02357 2G

SATURATED THICKNESS
The Blind Zone in Seismic Ground-Water Exploration, W79-02190 4B

SAUDI ARABIA
An Evaluation of Isotope Concentrations in the Ground Water of Saudi Arabia, W79-02254 2F

SAWGRASS
The Autecology of Sawgrass in the Florida Everglades, W79-02104 2L

SAWYER BEND (MO-ILL)
Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation, W79-02354 8B

SCALINE
Novel Compositions of Matter for Use in the Treatment of Aqueous Systems, W79-02335 5F

SCARCITY
Urban Water: Access, Delivery and Institutional Scarcity, W79-02036 6E

Implications of Alternative Measures of Natural Resource Scarcity, W79-02049 6B

Measuring Natural Resources Scarcity: Theory and Practice, W79-02059 6B

SCARCITY INDICES
Measuring Natural Resources Scarcity: Theory and Practice, W79-02059 6B

SCREENS
Drive Device for Rake Arm with Attached Screen Comb in Cleaning Device for a Water Conduit Screen, W79-02306 8C

Screening -- A Novel Approach to Primary Treatment, W79-02363 5D

SEA GRASSES
Distribution of Surficial Sediments and Eelgrass in New York's South Shore Bays: An Assessment from the Literature, W79-02162 2L

SEA WATER
Systematic Absorbance Errors with Technicon AutoAnalyzer II Colorimeters, W79-02074 2K

Photosynthetic Rates of Marine Algae as a Function of Inorganic Carbon Concentration, W79-02224 5C

SEASONAL
Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay, W79-02223 5C

Seasonal Changes in the Epiphyte Community of Natural and Artificial Macrophytes in Lake Memphremagog (QUE. and VT.), W79-02232 5C

SECONDARY SLUDGE
Bark as a Medium for Gravity Dewatering of Secondary Sludge from Pulp and Paper Mills, W79-02186 5D

SECONDARY SLUDGE DEWATERING
Bark as a Medium for Gravity Dewatering of Secondary Sludge from Pulp and Paper Mills, W79-02186 5D

SEDIMENT CONTROL
Controlling Sediment in Surface Runoff, W79-02097 3F

Consequences of Site Disturbances in the Upper Coastal Plain, W79-02431 4D

SEDIMENT DISTRIBUTION
Distribution of Surficial Sediments and Eelgrass in New York's South Shore Bays: An Assessment from the Literature, W79-02162 2L

Trace Element of the Sardis Reservoir, Mississippi, as Related to Clay Mineral Dispersion, W79-02187 2H

SEDIMENT TRANSPORT
A Contribution to the Lake Pleistocene Stratigraphy of the Susquehanna River Valley of New York, W79-02135 2J

Transportation and Accumulation of Fine-Grained Sediments in the Estuarine Environment: Recommendations for Research, W79-02165 2L

Flume Experiments on Sand, Silt, and Clay Mixtures from the Offshore Dredged Material Disposal Site, Galveston, Texas, W79-02348 5E

Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation,
W79-02354 8B

Splash and Discontinuous Runoff as Creators of Fine Sandy Lag Deposits with Kalahari Sands,
W79-02393 2J

SEDIMENT-WATER INTERFACES
A Material Balance Study of Polychlorinated Biphenyls in Lake Michigan,
W79-02017 5C

The Distribution and Form of Phosphorus in North Atlantic Ocean Deep-Sea and Continental Slope Sediments,
W79-02230 5B

SEDIMENTARY BASINS (GEOLOGIC)
Fossil Ground-Water Gradients in Arid Regional Sedimentary Basins,
W79-02189 2F

SEDIMENTARY SOILS
Water Quality of Streamflow from Forested Watersheds on Sedimentary Soils,
W79-02404 5B

SEDIMENTARY STRUCTURES
Subsurface Geological Investigation of a Pleistocene Braided Stream in the Northern Coastal Plain, Delaware (U.S.A.),
W79-02167 2J

SEDIMENTATION
Sedimentation in Hot Creek in Vicinity of Hot Creek Fish Hatchery, Mono County, California,
W79-02128 2J

Wind Induced Dispersion and Algal Growth in Shallow Lakes,
W79-02226 5G

SEDIMENTATION RATES
Role of Inorganic Ions in Controlling Sedimentation Rate of a Marine Centric Diatom Ditylum Brightwelli,
W79-02014 5C

Sedimentation Rates: Cypress Domes,
W79-02275 5C

SEDIMENTOLOGY
Investigation of Matrix Interferences for AAS Trace Metal Analyses of Sediments,
W79-02143 5A

SEDIMENTS
Controlling Sediment in Surface Runoff,
W79-02097 3F

Intertidal Environment of Northern Dublin Bay,
W79-02204 5B

The Distribution and Form of Phosphorus in North Atlantic Ocean Deep-Sea and Continental Slope Sediments,
W79-02230 5B

Interstital Water Chemistry of Anoxic Long Island Sound Sediments. 2. Nutrient Regeneration and Phosphate Removal,
W79-02243 5C

A Budget of Nitrogen Recycling in North Sea Sediments off the Belgian Coast,
W79-02245 5C

SEICHES
Organism Patchiness in Lakes Resulting from the Interaction Between the Internal Seiche and Planktonic Diurnal Vertical Migration,
W79-02009 5C

Seiches in the Baltic Sea and Their Effect on Floods in the Neva River Delta,
W79-02213 2L

SEISMIC DESIGN
Liquefaction Potential of Hydraulic Fills,
W79-02203 8D

SEISMIC REFRACTION
Geophysical Delineation of Buried Glacial River Valley Aquifers in Grundy County, Missouri,
W79-02154 2F

The Blind Zone in Seismic Ground-Water Exploration,
W79-02190 4B

SEISMIC STUDIES
The Blind Zone in Seismic Ground-Water Exploration,
W79-02190 4B

SELF-PURIFICATION
The Uptake of Dissolved Organic Matter by a Small Spring Stream,
W79-02248 5C

SEMIPERMEABLE MEMBRANES
Evaluation of Semipermeable Membranes for Concentration or Organic Contaminants in Drinking Water,
W79-02405 5A

SENSIBLE HEAT
The Micro-Climate of Narrow- and Wide-Row Sorghum With Equal Plant Densities,
W79-02358 2D

SEPARATION TECHNIQUES
Ozone Treatment of Cyanide-Bearing Plating Waste,
W79-02299 5D

SETTLEMENT
Acid Mine Drainage and Subsidence: Effects of Increased Coal Utilization,
W79-02409 5G

SETTLING BASINS
Fish Farms are Having to Watch Their Waste.
W79-02474 5G

SEWAGE DISPOSAL
Handling and Disposal of Sludges from Combined Sewer Overflow Treatment. Phase II - Impact Assessment,
W79-02303 5D

SEWAGE EFFLUENTS
Studies of the Ecology of Fish Populations in the Rye Meads Sewage Effluent Lagoons,
W79-02454 5C

The Crustacean Zooplankton of Grasmere Before and After a Change in Sewage Effluent Treatment,
W79-02458 5C

SEWAGE LAGOONS
Studies of the Ecology of Fish Populations in the Rye Meads Sewage Effluent Lagoons,
W79-02454 5C

SEWAGE TREATMENT
Minnesota's Peat Resources: Their Characteristics and Use in Sewage Treatment, Agriculture, and Energy,
W79-02255 5G

Handling and Disposal of Sludges from Combined Sewer Overflow Treatment. Phase II - Impact Assessment,
W79-02303 5D

Method and Apparatus for Removing Grit,
W79-02305 5D

Continuous Treatment of Liquid Effluent and Sewage,
W79-02310 5D

The Crustacean Zooplankton of Grasmere Before and After a Change in Sewage Effluent Treatment,
W79-02458 5C

SEWERS
Advances in Storm and Combined Sewer Pollution Control Abatement Technology,
W79-02437 5D

Storm and Combined Sewer Pollution Control Program Reports. Research, Development, and Demonstration Grant, Contract, and In-House Project Reports.
W79-02442 5G

SHAGAWA LAKE (MN)
A Paleolimnological Comparison of Burntside and Shagawa Lakes, Northeastern Minnesota,
W79-02295 5C

SHAPE
Physical Properties of Icebergs, Part I--Height to Draft Ratios of Icebergs, Part II--Mass Estimation of Arctic Icebergs,
W79-02216 2C

SHEER STRESS
Practical Riprap Design,
W79-02351 8B

SHELLFISH
Proceedings of the Interstate Seafood Seminar October 4-7, 1977.
W79-02163 5G

SHIELD'S DESIGN
Practical Riprap Design,
W79-02351 8B

SHOALING
Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation,
W79-02354 8B

SHORE PROTECTION
Tire Module Systems in Shore and Harbor Protection,
W79-02201 8G

SHRIMP
Possible Toxic Effects of the Marine Blue-Green Alga, Spirulina Subsalsa, on the Blue Shrimp, Penaeus Stylirostris,
W79-02459 5C

Uptake, Retention and Loss of Cadmium by Brown Shrimp, (Crangon Crangon),
W79-02463 5B

Effects of Some Environmental Factors on Growth and Food Consumption of the Baltic Palaemonid Shrimp, Palaemon Adspersus Var. Fabricii (Rathke),
W79-02465 5C

SILICA
The Role of Silica and the Vernal Diatom Bloom in Controlling the Growth of Nuisance Algal Populations in Lakes,
W79-02152 5C

SILICATES
The Nutrient Contents of North Sea Water: Changes in Recent Years, Particularly in the Southern Bight,
W79-02468 5B

SILT-FENCE
The Effect of Silt-Fence on the Prevention of Sea Water Siltation Caused by Dredging and Reclaiming Work in Harbor, (In Japanese),
W79-02481 5C

SILTS
The Effect of Silt-Fence on the Prevention of Sea Water Siltation Caused by Dredging and Reclaiming Work in Harbor, (In Japanese),
W79-02481 5C

SIMULATION ANALYSIS
A Dynamic Lake Model for Trophic State Prediction,
W79-02006 5C

Examination of a Lake Model,
W79-02007 5C

A Simulation Model for Phytoplankton Growth and Nutrient Cycling in Eutrophic, Shallow Lakes,
W79-02008 5C

Application of a Model of Zooplankton Composition to Problems of Fish Introductions to the Great Lakes,
W79-02020 5C

A Simulation Model for Resource Policy Evaluation,
W79-02025 6A

Some Comparisons of Flood Statistics in Real and Log Space,
W79-02119 2E

Computer Assisted Instruction in Natural Resource Management,
W79-02161 7C

Simulated Flow Through the Root Xylem,
W79-02199 2I

Simulation Model of Cryptomonas Ovata Population Dynamics in Southern Kootenay Lake, British Columbia,
W79-02225 5C

Physical Model Simulation of the Hydraulics of Masonboro Inlet, North Carolina,
W79-02353 8B

Brook: A Hydrologic Simulation Model for Eastern Forests,
W79-02448 4D

SITE PRODUCTIVITY
Consequences of Site Disturbances in the Upper Coastal Plain,
W79-02431 4D

SITES
Coordinating Public Utility Expansion, Industrial Siting and Pollution Control: A Working Dynamic Programming Algorithm,
W79-02039 5G

Is It Time to Do a Benefit-Cost Analysis for the Location of a Power Plant,
W79-02054 6B

SIX-MILE RUN (NJ)
The Effects of Storm Events on the Annual Phosphorus Transport in Six-Mile Run,
W79-02153 5B

SKAN BAY (AK)
Ammonium Oxidation and its Significance in the Summer Cycling of Nitrogen in Oxygen Depleted Skan Bay, Unalaska Islanda, Alaska,
W79-02004 5C

SLUDGE DEWATERING
Bark as a Medium for Gravity Dewatering of Secondary Sludge from Pulp and Paper Mills,
W79-02186 5D

SLUDGE DISPOSAL
Economic Evaluation of Four Sludge Dewatering Devices,
W79-02037 5D

Handling and Disposal of Sludges from Combined Sewer Overflow Treatment. Phase II - Impact Assessment,
W79-02303 5D

SLUDGE TREATMENT
Economic Evaluation of Four Sludge Dewatering Devices,
W79-02037 5D

Combination Limestone-Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02150 5D

Investigations of Heat Treatment for Paper Mill Sludge Conditioning,
W79-02296 5E

Experience with Drum Dryers for Activated Sludge (Opyt naladki barabannykh sushilok aktivnogo ila),
W79-02385 5E

Partial Characterization of Chlorinated Organics in Superchlorinated Septages and Mixed Sludges,
W79-02413 5D

SLUG TESTS
A Note on Packer, Slug, and Recovery Tests in Unconfined Aquifers,
W79-02179 8G

SMALL WATERSHEDS
Role of Ground Waters in the Formation of the Total Runoff of a Small Drainage Basin in the Forest Zone,
W79-02211 4B

SNOW STORAGE
Analysis of Error in the Determination of Snow Storage for Small High Arctic Basins,
W79-02197 2C

SNOW SURVEYS
Analysis of Error in the Determination of Snow Storage for Small High Arctic Basins,
W79-02197 2C

SNOWMELT RUNOFF
Pollutional Characteristics of Stormwater Runoff,
W79-02451 5B

SNOWPACKS
Analysis of Error in the Determination of Snow Storage for Small High Arctic Basins,
W79-02197 2C

SOCIAL ASPECTS
Profile and Measurement of Social Well-Being Indicators for Use in the Evaluation of Water and Related Land Management Planning,
W79-02344 6B

Nine Fallacies of Natural Disaster: The Case of the Sahel,
W79-02398 6B

SOCIAL WELL-BEING INDICATORS
Profile and Measurement of Social Well-Being Indicators for Use in the Evaluation of Water and Related Land Management Planning,
W79-02344 6B

SOIL ANALYSIS
Investigation of Matrix Interferences for AAS Trace Metal Analyses of Sediments,
W79-02143 5A

SOIL CHEMICAL PROPERTIES
Differential Effect of Bermuda and Bahiagrasses on Soil Chemical Characteristics,
W79-02381 3F

SOIL COLUMNS
Disappearance of Nitrate Under Transient Conditions in Columns of Soil,
W79-02122 2G

SOIL COLUMNS. NITRATE-NITROGEN
Reduction of Nitrate in a Soil Column During Continuous Flow,
W79-02366 2G

SOIL CONTAMINATION
Virus Transport Through Solid Beds,
W79-02447 5B

SOIL EROSION
A Computer Simulation of Phosphate and Nitrogen Transport by Water Runoff,
W79-02251 5B

Consequences of Site Disturbances in the Upper Coastal Plain,
W79-02431 4D

SOIL INVESTIGATIONS
Volatility of Mercury from Soils Amended with Various Mercury Compounds,
W79-02142 5B

SOIL MOISTURE
Effect of Sewage Effluent in Cypress Ponds on Surrounding Soil Moisture and Nutrient Content and on Growth of Pine Trees (Summary of MS Thesis),
W79-02273 5C

SOIL MOISTURE METER
Material Content of Binary Physical Mixture as Measured with a Dual-Energy Beam of Gamma Rays,
W79-02356 2G

SOIL PHYSICAL PROPERTIES
Consequences of Site Disturbances in the Upper Coastal Plain,
W79-02431 4D

SOIL TEMPERATURE
Yield Response to Soil Warming: Agronomic Crops,
W79-02490 3F

SOIL WATER
Growth and Yield of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02035 3F

Plant Water Relationships of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02043 3F

SOIL WATER MOVEMENT
Transpiration Effects on Leaching Fractions,
W79-02019 3C

SOIL-WATER-PLANT RELATIONSHIPS
Design and the Desert Environment: Landscape Architecture in the American Southwest,
W79-02389 3B

SOILS
Computation of Soil Freezing Depth in the Zone of Aeration,
W79-02215 2C

SOLUBILITY
Reaction Products and Solubility of Applied Zinc Compounds in Some Manitoba Soils,
W79-02362 2K

SOMERSET (NY)
Is It Time to Do a Benefit-Cost Analysis for the Location of a Power Plant,
W79-02054 6B

SONG BIRDS
Comparison of Fall Birds Present in a Natural Cypress Dome, and the Adjacent Pine Plantation,
W79-02280 5C

SORGHUM
The Micro-Climate of Narrow- and Wide-Row Sorghum With Equal Plant Densities,
W79-02358 2D

Physiological Aspects of Water Use Efficiency,
W79-02449 2I

SOUTH CAROLINA
Determination of Methylmercury in Fish of South Carolina,
W79-02478 5A

SOUTHWEST U.S.
Design and the Desert Environment: Landscape Architecture in the American Southwest,
W79-02389 3B

Water-Quality Monitoring in the American Urbanizing Southwest,
W79-02397 5B

SPAIN
The Urquiola Oil Spill, La Coruna, Spain: Impact and Reaction on Beaches and Rocky Coasts,
W79-02500 5C

SPARTINA ALTERNIFLORA
Biochemical and Transpiration Studies of the Growth Form of Spartina Alterniflora on Connecticut Salt Marshes,
W79-02101 2I

SPATIAL DISTRIBUTION
A Pattern Analysis of Clear Lake Phytoplankton,
W79-02227 5C

Soft-Shore Macrobenthos Along the South-West Coast of Wales,
W79-02240 5C

SPECIFIC YIELD
Ground Water...California's Priceless Resource,
W79-02392 4B

SPECTROPHOTOMETRY
Investigation of Matrix Interferences for AAS Trace Metal Analyses of Sediments,
W79-02143 5A

SPEWRELL DAM PROJECT (GA)
Measurement of Economic Uncertainty in Public Water Resource Development: An Extension,
W79-02050 6B

SPILLS
Hazardous Material Spills: A Documentation and Analysis of Historical Data,
W79-02411 5G

SPRINKLER IRRIGATION
Lawn Sprinkler Distribution Patterns,
W79-02155 3F

Reciprocable Sprinkler,
W79-02318 3F

Wind, Sprinkler Patterns, and System Design,
W79-02368 3F

SPRUCE RUN CREEKS (NJ)
Storm Derived Losses of Phosphorus and their Significance to Annual Phosphorus Export from Two New Jersey Watersheds,
W79-02151 5B

STABILITY
Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

STABLE ISOTOPES
An Evaluation of Isotope Concentrations in the Ground Water of Saudi Arabia,
W79-02254 2F

STANDARDS
The Choice of Efficient Pollution Policies: Technology and Economics in the Control of Sulphur Dioxide,
W79-02038 5G

Pricing and Standards in the Control of Pollution,
W79-02057 5G

STAPLE THEORY
Natural Resources and Regional Disparities: A Skeptical View,
W79-02034 6B

STATE GOVERNMENTS
The Controversy Continues: State Ownership of Drill Rigs,
W79-02168 6E

STATISTICAL ANALYSIS
Management of Rural Water Supply Peak Flow Rates,
W79-02194 3D

STATISTICAL METHODS
A Statistical Evaluation of Some Columbia River Basalt Chemical Analysis,
W79-02433 5A

STATISTICAL MODELS
A Pattern Analysis of Clear Lake Phytoplankton,
W79-02227 5C

STEROIDS
The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

STOCHASTIC MODELS
Stochastic Modeling for Predicting Frequency Distribution of Stages in Thermal Lakes at Future Planning Horizons,
W79-02495 4A

STOCHASTIC PROCESSES
Some Comparisons of Flood Statistics in Real and Log Space,
W79-02119 2E

STORAGE
Analysis of Error in the Determination of Snow Storage for Small High Arctic Basins,
W79-02197 2C

STORAGE TANKS
Water Systems Basics, (2),
W79-02181 8C

STORM DRAINS
Storm and Combined Sewer Pollution Control Program Reports. Research, Development, and Demonstration Grant, Contract, and In-House Project Reports.
W79-02442 5G

STORM RUNOFF
Storm Derived Losses of Phosphorus and their Significance to Annual Phosphorus Export from Two New Jersey Watersheds,
W79-02151 5B

The Effects of Storm Events on the Annual Phosphorus Transport in Six-Mile Run,
W79-02153 5B

Precipitation and Runoff Water Quality from an Urban Parking Lot and Implications for Tree Growth,
W79-02387 5B

Advances in Storm and Combined Sewer Pollution Control Abatement Technology,
W79-02437 5D

Pollutional Characteristics of Stormwater Runoff,
W79-02451 5B

STORM WATER TREATMENT
Advances in Storm and Combined Sewer Pollution Control Abatement Technology,
W79-02437 5D

STRATIFIED DRIFT
A Contribution to the Lake Pleistocene Stratigraphy of the Susquehanna River Valley of New York,
W79-02135 2J

STRATIGRAPHY
A Contribution to the Lake Pleistocene Stratigraphy of the Susquehanna River Valley of New York,
W79-02135 2J

Subsurface Stratigraphy and Water Resources of Cass County, Indiana,
W79-02185 4B

Hydrology of the Austin Cary Control Dome,
W79-02260 5E

STREAMFLOW
Effects of Forest Workings on Streamflow and Water Quality (Part I),
W79-02005 5C

Flow Characteristics of Streams in Tutuila, American Samoa,
W79-02124 2E

Estimates of 7-Day, 10-Year Minimum Flows at Selected Stream Sites in Puerto Rico,
W79-02125 5B

Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

Water Quality of Streamflow from Forested Watersheds on Sedimentary Soils,
W79-02404 5B

STREAMING POTENTIAL
Streaming-Potential Effects in Saturated Water Flow Through a Sand-Kaolinite Mixture,
W79-02160 2G

Electrical Potentials During Water Entry into an Air-Dry Mixture of Sand and Kaolinite,
W79-02357 2G

STREAMS
Aquatic Plant Management in Semi-Natural Streams: The Role of Marginal Vegetation,
W79-02012 5G

Drainage Map of Arizona Showing Perennial Streams and Some Important Wetlands,
W79-02121 7C

Sedimentation in Hot Creek in Vicinity of Hot Creek Fish Hatchery, Mono County, California,
W79-02128 2J

The Uptake of Dissolved Organic Matter by a Small Spring Stream,
W79-02248 5C

Particulate and Dissolved Organic Matter in a Small Partly Forested Ontario Stream,
W79-02252 5C

STRIP MINE LAKES
Preliminary Evaluation of Final Cut Lakes,
W79-02292 5G

STRIP MINES
Preliminary Evaluation of Final Cut Lakes,
W79-02292 5G

STRUCTURAL ANALYSIS
The Water Supply System of Caesarea Maritima,
W79-02399 8B

STRUCTURAL GEOLOGY
Study of River Meandering in the Search for Tectonic Structures (As Exemplified by the Middle Dniester Region),
W79-02205 8E

Holocene Faulting in the Western Grand Canyon, Arizona,
W79-02496 2J

SUBMERGED PLANTS
Maximum Depth Inhabited by Aquatic Vascular Plants,
W79-02249 5C

Production of Submerged Aquatic Plant Communities of Doodhadhari Lake Raipur, (M. P. India),
W79-02419 2I

SUBMERGENCE
Effects of Simulated Flooding on Alligator Eggs,
W79-02116 2L

SUBMERSIBLE PUMPS
Water Systems Basics, (2),
W79-02181 8C

SUBSIDENCE
Land Subsidence Due to Water Withdrawal in the Vicinity of Pecos, Texas,
W79-02396 4B

SUBSTRATES
Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

SUBSURFACE INVESTIGATIONS
The Downhole TV Camera Can 'See' What's Wrong,
W79-02178 8G

SUCCESSION
Vegetation Changes in a Small Michigan Bog from 1917 to 1972,
W79-02091 2H

The Effect of Drawdown Date on Wetland Plant Succession,
W79-02424 2I

SUGAR CANE
Sugar Cane Growth in Response to Mulch and Fertilizer on Saline-Alkali Subsoils,
W79-02029 3C

SULFATES
The Behavio of Sulfate on Salt Input in Podzolic Brown Earth,
W79-02321 2K

Reaction Products and Solubility of Applied Zinc Compounds in Some Manitoba Soils,
W79-02362 2K

SULFIDES
Analyses of Paper Machine Waters with Ion Specific Electrodes. Part V. Sulfide Determination Using Ag(+) Ion Specific Electrode and Various Measurement Methods,
W79-02388 5A

SULFITE PULP MILLS
Possibility of Rendering Bleachery Effluents Harmless by Technological Changes (Ueber die Moeglichkeit Bleichereiabwaesser durch technologische Aenderungen unschaedlich zu machen),
W79-02360 5G

Pulp Industry and Water Pollution Control (Zellstoffindustrie und Gewaesserschutz),
W79-02370 5G

SULFONATES
Conversion of Lignosulfonates in Natural Waters (Prevrashchenie lignosul'fonatov v prirodnykh vodakh),
W79-02379 5B

SULFUR DIOXIDE
The Choice of Efficient Pollution Policies: Technology and Economics in the Control of Sulphur Dioxide,
W79-02038 5G

SUPERCOOLING
Supercooling of Water to -92 Degrees C Under Pressure,
W79-02494 2C

SURF
Blooms of Surf-Zone Diatoms Along the Coast of the Olympic Peninsula, Washington, IX. Factors Controlling the Seasonal Cycle of Nitrate in the Surf at Copalis Beach (1971 through 1975),
W79-02244 5C

SURFACE DRIFTERS
Surface Drifter Movements Observed in Port Angeles Harbor and Vicinity, April 1978,
W79-02221 2L

SURFACE-GROUNDWATER RELATIONSHIPS
Development of a Stream-Aquifer Model Suited for Management,
W79-02450 4B

SURFACE WATER
Surface Water VS. Ground Water,
W79-02176 4B

SURFACE WATERS
Water Resources Data for Washington, Water year 1977--Volume 1. Western Washington.
W79-02138 7C

Water Resources Data for Washington, Water year 1977--Volume 2. Eastern Washington.
W79-02139 7C

Water Resources Data for Tennessee, Water Year 1977.
W79-02140 7C

Water Resources Data for Georgia, Water Year 1977.
W79-02141 7C

Range Cattle Impacts on Stream Water Quality in the Colorado Front Range,
W79-02386 5G

SURGES
Seiches in the Baltic Sea and Their Effect on Floods in the Neva River Delta,
W79-02213 2L

Bay Springs Canal Surge Study, Tennessee-Tombigbee Waterway, Mississippi and Alabama; Hydraulic Model Investigation,
W79-02352 8B

SUSPENDED SOLIDS
Drainage Device for Particulate Material,
W79-02326 5D

The Effect of Silt-Fence on the Prevention of Sea Water Siltation Caused by Dredging and Reclaiming Work in Harbor, (In Japanese),
W79-02481 5C

The Pollution of Sea-Water in Nagasaki Bay in Summer 1976 and 1977, (In Japanese),
W79-02482 5B

SUSQUEHANNA RIVER BASIN (NY)
A Contribution to the Lake Pleistocene Stratigraphy of the Susquehanna River Valley of New York,
W79-02135 2J

SWAMPS
Forested Wetlands of Florida-Their Management and Use,
W79-02112 6B

Cypress Wetlands for Water Management, Recycling and Conservation (Third Annual Report, November 1, 1975 to December 15, 1976),
W79-02256 2I

Hydrology and Water Budgets of Cypress Domes,
W79-02257 5B

Hydrologic Budget Model,
W79-02258 2H

Stratigraphy and Hydrogeologic Correlation Studies in Several Cypress Domes-North Central Florida,
W79-02259 5E

Hydrology of the Austin Cary Control Dome,
W79-02260 5E

Radiation Studies: Cypress Wetlands,
W79-02261 2I

Seasonal Changes in the Distribution of Water Fern and Duckweed in Cypress Domes Receiving Sewage,
W79-02262 2I

Changes in Understory Vegetation in Cypress Domes Brought About by Fire and Addition of Sewage,
W79-02263 5C

Uptake and Distribution of Phosphorus in the Understory of Cypress Domes,
W79-02264 5C

Litterfall and Litter Decomposition in Four Cypress Domes,
W79-02265 2I

Air Emissions from Cypress Swamps,
W79-02266 5C

The Response of Benthic Invertebrate Populations to Sewage Addition,
W79-02267 5C

Coliform Monitoring of Waters Associated with the Cypress Dome Project,
W79-02268 5C

Water Quality of Cypress Domes: Routine Sampling Program,
W79-02269 5C

Denitrification and Surface Runoff in the Experimental Domes: Cypress Wetlands,
W79-02270 5C

Rates of Growth and Nutrient Concentrations of Trees in Cypress Domes,
W79-02271 5C

Growth Rates of Seedlings Planted in Cypress Domes,
W79-02272 5C

Effect of Sewage Effluent in Cypress Ponds on Surrounding Soil Moisture and Nutrient Content and on Growth of Pine Trees (Summary of MS Thesis),
W79-02273 5C

Effect of Sewage Effluent in Cypress Ponds on Growth of Surrounding Pine Seedlings and Trees,
W79-02274 5C

Sedimentation Rates: Cypress Domes,
W79-02275 5C

Nitrogen Transformations in Water and Sediments of Cypress Domes with and without Added Sewage Effluent,
W79-02276 2H

Comparative Studies of Cypress Ecosystems,
W79-02277 2H

Distribution of Chlorophyll in Cypress Ecosystems,
W79-02278 2I

The Effects of Perturbation on Cypress Dome Animal Communities,
W79-02279 5C

Comparison of Fall Birds Present in a Natural Cypress Dome, and the Adjacent Pine Plantation,
W79-02280 5C

Progress Repot on Mosquitoe Research: Cypress Domes,
W79-02281 5G

Ecosystem Analyses at Corkscrew Swamp,
W79-02282 2I

Accelerating Secondary Succession in Cypress Strands,
W79-02283 2I

The Organic Sediments of Corkscrew Swamp Sanctuary,
W79-02284 2H

Dissolved Hydrogen Sulfide in Soil Water in San Felasco Hammock and Deerhaven Cypress Dome,
W79-02285 5B

The Projected Cost of Cypress Wetland Disposal for Waldo, Florida,
W79-02286 5E

Cypress Growth Response in a Sewage-Enriched Pond Cypress Ecosystem,
W79-02287 5C

Investigation of the Microflora of Swamp Ore and Lake Water by the Method of Electron Microscopy, (In German),
W79-02423 5A

SWEDEN
Atmospheric Formation, Dispersion, and Deposition of Acid Substances,
W79-02015 5A

SYDNEY (AUSTRALIA)
An Analysis of Network Costs: A Study of Sydney's Water Supply from 1890 to 2001, Part I: Research Methods,
W79-02033 6B

SYMBIOSIS
The Uptake, Retention, and Release of Ammonium by Reef Corals,
W79-02228 5C

SYNOPTIC ANALYSIS
A Pattern Analysis of Clear Lake Phytoplankton,
W79-02227 5C

TECHNOLOGY
The Choice of Efficient Pollution Policies: Technology and Economics in the Control of Sulphur Dioxide,
W79-02038 5G

The Business of Pollution Control - A Bed of Roses or Thorns.
W79-02044 5G

Costly Innovation and Natural Resources,
W79-02062 6B

TENNESSEE
Water Resources Data for Tennessee, Water Year 1977.
W79-02140 7C

TENNESSEE-TOMBIGBEE WATERWAY (ALA-MISS)
Bay Springs Canal Surge Study, Tennessee-Tombigbee Waterway, Mississippi and Alabama; Hydraulic Model Investigation,
W79-02352 8B

TESTING PROCEDURES
Macroinvertebrate Sampling Techniques For Streams in Semi-Arid Regions: Comparison of the Surber Method and A Unit-Effort Traveling Kick Method,
W79-02146 5A

TEXAS
Financing System Changes,
W79-02023 6C

Improved Techniques for Evaluating Carbonate Waterfloods in West Texas,
W79-02182 4B

Flume Experiments on Sand, Silt, and Clay Mixtures from the Offshore Dredged Material Disposal Site, Galveston, Texas,
W79-02348 5E

THEORETICAL ANALYSIS
The Long-Run Movement of the Prices of Exhaustible Resources,
W79-02026 6C

Issues in Water Development Decisions: A Discussion Paper,
W79-02042 6B

Some Extensions of the Economic Theory of Exhaustible Resources,
W79-02064 6B

THERMAL DISSOCIATION
Ion Mobilities in Pure Water Vapour at Saturation,
W79-02076 1B

THERMAL POLLUTION
Effects of Thermal Discharges on Mortality of Mercenaria Mercenaria in Barnegat Bay, New Jersey,
W79-02473 5C

THERMAL STRATIFICATION
Limnology of Selected Lakes in Ohio - 1975,
W79-02126 2H

THERMAL TOLERANCE
Thermal Tolerance and Preference of the Indian Catfish Heteropneustes Fossilis,
W79-02455 5C

THERMAL WATER
Origins of Water and Solutes in the Geopressured Zones of the Northern Gulf of Mexico Basin,
W79-02131 2K

TIDAL EFFECTS
Do Tides Affect Coastal Insect Communities,
W79-02089 2L

Surface Drifter Movements Observed in Port Angeles Harbor and Vicinity, April 1978,
W79-02221 2L

TIDAL MARSHES
A Bibliography of Maryland's Tidal Wetlands (Marshes-Swamps),
W79-02111 2L

TIDES
Do Tides Affect Coastal Insect Communities,
W79-02089 2L

TILAPIA
Influence of Water Soluble Excreta on Oxygen Consumption of Tilapia Zillii,
W79-02462 5C

Effect of Methallibure on the Hypophysis and Gonadal Development of the Cichlid Fish, Tilapia Mossambica,
W79-02477 5C

TIMING
Pricing and Standards in the Control of Pollution,
W79-02057 5G

TIPULA
Effect of Antimycin on Stream Insects in Field and Laboratory Trials,
W79-02156 5C

TIRES
Tire Module Systems in Shore and Harbor Protection,
W79-02201 8G

TOXAPHENE
Wastewater Treatment Technology Documentation for Toxaphene Manufacture,
W79-02439 5D

TOXICITY
Effect of Antimycin on Stream Insects in Field and Laboratory Trials,
W79-02156 5C

Proceedings of the Interstate Seafood Seminar October 4-7, 1977.
W79-02163 5G

Bioaccumulation Potential and Acute Toxicity of Synthetic Fuels Effluents in Freshwater Biota: Azaarenes,
W79-02241 5C

Considerations in Conducting Bioassays,
W79-02349 5A

Toxicity, BOD, and Color of Effluents from Novel Bleaching Processes,
W79-02374 5C

Fish Test With Golden Orfe -- Testing the Toxicity of Matter Contained in Water (Fischtest

mit Goldorfen -- Pruefung der Toxizitaet von Wasserinhaltsstoffen),
W79-02375 5C

Possible Toxic Effects of the Marine Blue-Green Alga, Spirulina Subsalsa, on the Blue Shrimp, Penaeus Stylirostris,
W79-02459 5C

Blood Corpuscle Resistance of Carp Died of Environmental Hypoxia and of Cyanide Poisoning, (In Japanese),
W79-02471 5C

Effect of Hexachlorobenzene (HCB) on Photosynthetic Oxygen Evolution and Respiration of Chlorella Pyrenoidosa,
W79-02480 5C

Microorganisms and Heavy metal Toxicity,
W79-02483 5C

Effect of Barite (BASO4) on Development of Estuarine Communities,
W79-02484 5C

TOXIGENIC ALGAE
Possible Toxic Effects of the Marine Blue-Green Alga, Spirulina Subsalsa, on the Blue Shrimp, Penaeus Stylirostris,
W79-02459 5C

TRACE ELEMENTS
Investigation of Matrix Interferences for AAS Trace Metal Analyses of Sediments,
W79-02143 5A

Trace Element of the Sardis Reservoir, Mississippi, as Related to Clay Mineral Dispersion,
W79-02187 2H

TRACKING TECHNIQUES
Telemetric Determination of Salmonid Winter Micro-Habitat Occupation and Movement in Ice-Covered Streams,
W79-02157 7B

TRAINING
The Need for Professionalism and its Attributes in Hydrogeology,
W79-02174 6E

TRANSIENT FLOW CONDITIONS (SOILS)
Disappearance of Nitrate Under Transient Conditions in Columns of Soil,
W79-02122 2G

TRANSPARENCY
Maximum Depth Inhabited by Aquatic Vascular Plants,
W79-02249 5C

TRANSPIRATION
Transpiration Effects on Leaching Fractions,
W79-02019 3C

TRANSPIRATION CONTROL
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

TREATMENT
Increasing Efficiency of Aquatic Plant Management Through Processing,
W79-02158 4A

TREATMENT FACILITIES
EPA's Construction Grants Program: Perspectives Costs,
W79-02027 5G

Overseas Markets for the Water Industry - Nigeria,
W79-02030 5G

New Pulp Mill Strikes Low Profile.
W79-02102 5D

Winery Wastewater Characteristics and Treatment,
W79-02297 5D

Characterization and In-Plant Reduction of Wastewater from Hog Slaughtering Operations,
W79-02298 5D

Operation of the (Effluent) Purification Equipment at the Razlog Pulp and Paper Mill (Opit ot rabota na prechisvatelnata stantsiya kem KTsKh Razlog),
W79-02367 5D

Benzidine: Wastewater Treatment Technology,
W79-02445 5D

TREES
Aquatic Plant Management in Semi-Natural Streams: The Role of Marginal Vegetation,
W79-02012 5G

Cypress Growth Response in a Sewage-Enriched Pond Cypress Ecosystem,
W79-02287 5C

Precipitation and Runoff Water Quality from an Urban Parking Lot and Implications for Tree Growth,
W79-02387 5B

TRITIUM
Tritium in the Waters of Yellowstone National Park,
W79-02130 2F

TROPHIC LEVEL
A Dynamic Lake Model for Trophic State Prediction,
W79-02006 5C

Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships of Lakes,
W79-02247 5C

Recent Changes in Plankton Communities and Present Trophic State of Lake Steinsfjord,
W79-02250 5C

A Paleolimnological Comparison of Burntside and Shagawa Lakes, Northeastern Minnesota,
W79-02295 5C

TROUT
Sedimentation in Hot Creek in Vicinity of Hot Creek Fish Hatchery, Mono County, California,
W79-02128 2J

The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

TUNDRA
Root Production and Root Turnover in a Wet Tundra Ecosystem, Barrow, Alaska,
W79-02100 2I

TURBIDITY
Innovative Water System Solves Quality Problem,
W79-02183 5G

TURKMEN SSR
Remote Sensing Techniques and the Monitoring of Desertification Processes in Arid Areas,
W79-02390 7B

TURNOVERS
Root Production and Root Turnover in a Wet Tundra Ecosystem, Barrow, Alaska,
W79-02100 2I

TURPENTINE
Sulfate Turpentine in Unpurified and Purified Effluents from the Baikal Pulp Mill (Sul'fatnyi skipidar v neochishchennykh i ochishchennykh stokakh Baikal'skogo Tsellyuloznogo Zavoda),
W79-02378 5B

TUTUILA
Flow Characteristics of Streams in Tutuila, American Samoa,
W79-02124 2E

UNCONFINED AQUIFERS
A Note on Packer, Slug, and Recovery Tests in Unconfined Aquifers,
W79-02179 8G

UNITED KINGDOM
Quantification, Decision-Making and Environmental Impact Assessment in the United Kingdom.
W79-02028 6G

UNITED STATES
Coefficients of Pollution: Interindustry Linkage and Pollution in Belgium,
W79-02031 5G

UNSATURATED FLOW
Water Infiltration into Uniform and Stratified Soils I. Review and Use of an Approximate Theory,
W79-02492 2G

Water Infiltration into Uniform and Stratified Soils II. Experimental Evaluation of an Approximate Theory,
W79-02493 2G

URBAN DRAINAGE
Economic Impact of Alternative Stormwater Drainage Systems,
W79-02289 5D

URBAN HYDROLOGY
Water-Quality Monitoring in the American Urbanizing Southwest,
W79-02397 5B

URBAN RUNOFF
Comparison of the Predictive Accuracy of Models of Urban Flow and Water-Quality Processes,
W79-02253 5B

URBANIZATION
Planning and Modeling in Urban Water Management,
W79-02288 6B

USSR
Study of River Meandering in the Search for Tectonic Structures (As Exemplified by the Middle Dniester Region),
W79-02205 8E

Forecast of the Flash Flood Hydrograph on the Ingoda River,
W79-02207 4A

Complex Relations Between the Hydrologic Budget of the Major Geographic Zones of the Earth,
W79-02208 2A

Geographic Aspects of the Territorial Redistribution of Water Resources,
W79-02209 4A

Mechanism of Formation and Forecast of the Development of the Volga Delta,
W79-02210 2J

Role of Ground Waters in the Formation of the Total Runoff of a Small Drainage Basin in the Forest Zone,
W79-02211 4B

Long-Period Ground-Water Regime in the Excessively Wet Zone of the European USSR,
W79-02212 2F

Seiches in the Baltic Sea and Their Effect on Floods in the Neva River Delta,
W79-02213 2L

Instruments for Monitoring the Quality of Natural and Waste Waters,
W79-02214 5A

Computation of Soil Freezing Depth in the Zone of Aeration,
W79-02215 2C

Construction and Operation of Low-Pressure Dams on Permafrost Soils,
W79-02220 8D

UTAH

Management of Rural Water Supply Peak Flow Rates,
W79-02194 3D

Consumer Surplus and Economic Rent Estimates of Recreation Value: An Empirical and Theoretical Comparison,
W79-02290 6B

VEGETATION

Vegetation Changes in a Small Michigan Bog from 1917 to 1972,
W79-02091 2H

Angiosperm Production of Three Virginia Marshes in Various Salinity and Soil Nutrient Regimes,
W79-02108 2L

The Vegetation of Southern Florida,
W79-02425 2I

VEGETATION ESTABLISHMENT

Aquatic Plant Management in Semi-Natural Streams: The Role of Marginal Vegetation,
W79-02012 5G

Design and the Desert Environment: Landscape Architecture in the American Southwest,
W79-02389 3B

VEGETATION REGROWTH

Accelerating Secondary Succession in Cypress Strands,
W79-02283 2I

VERTICAL MIGRATION

Organism Patchiness in Lakes Resulting from the Interaction Between the Internal Seiche and Planktonic Diurnal Vertical Migration,
W79-02009 5C

VIRGINIA

Chemical Quality of Ground Water in Fairfax County, Virginia,
W79-02133 7C

Flood-Plain Delineation for Cub Run Basin, Fairfax County, Virginia,
W79-02137 2E

An Economic Approach to Water Supply Planning in Southeastern Virginia,
W79-02294 6B

VIRUSES

Adsorption of Poliovirus Type I to Wastewater Treatment Plant Solids,
W79-02446 5D

Virus Transport Through Solid Beds,
W79-02447 5B

VOLGA RIVER (USSR)

Mechanism of Formation and Forecast of the Development of the Volga Delta,
W79-02210 2J

WALES

Soft-Shore Macrobenthos Along the South-West Coast of Wales,
W79-02240 5C

WASHINGTON

Water Resources Data for Washington, Water year 1977--Volume 1. Western Washington.
W79-02138 7C

Water Resources Data for Washington, Water year 1977--Volume 2. Eastern Washington.
W79-02139 7C

Aquatic Disposal Field Investigations Duwamish Waterway Disposal Site Puget Sound, Washington, Evaluative Summary,
W79-02350 5C

WASTE ASSIMILATIVE CAPACITY

Estimates of 7-Day, 10-Year Minimum Flows at Selected Stream Sites in Puerto Rico,
W79-02125 5B

WASTE CHARACTERISTICS

Pollutional Characteristics of Stormwater Runoff,
W79-02451 5B

WASTE DISPOSAL

You Can Tailor Effluent BOD to Fit the Receiving-Water Ecosystem...and Enhance the Environment. Urban and Fish-Processing Wastes in the Marine Environment: Bioenhancement Studies at Terminal Island, California,
W79-02164 5E

Dredge Spoil in Mississippi Sound,
W79-02188 5E

Analysis of the Environmental Control Technology for Oil Shale Development,
W79-02432 5G

Hazardous Waste Disposal Damage Reports, Document No 2.
W79-02443 5E

Effects of Burial on the Heart Cockle Clinocardium Nuttallii and the Dungeness Crab Cancer Magister,
W79-02472 5C

The Effect of Silt-Fence on the Prevention of Sea Water Siltation Caused by Dredging and Reclaiming Work in Harbor, (In Japanese),
W79-02481 5C

WASTE DISPOSAL SITES

Perimeter Dike Raising with Dewatered Fine-Grained Dredged Material at Upper Polecat Bay Disposal Area, Mobile, Alabama,
W79-02345 5E

Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix A: Planktonic Communities, Benthic Assemblages, and Fishery,
W79-02346 5E

Ability of Salt Marshes to Remove Nutrients and Heavy Metals from Dredged Material Disposa Area Effluents,
W79-02347 5E

Flume Experiments on Sand, Silt, and Clay Mixtures from the Offshore Dredged Material Disposal Site, Galveston, Texas,
W79-02348 5E

Aquatic Disposal Field Investigations Duwamish Waterway Disposal Site Puget Sound, Washington, Evaluative Summary,
W79-02350 5C

WASTE HEAT

Yield Response to Soil Warming: Agronomic Crops,
W79-02490 3F

WASTE IDENTIFICATION

Quantitative Mapping by Remote Sensing of an Ocean Acid-Waste Dump,
W79-02407 5A

WASTE STORAGE

Fresh Water Supply and Waste Water Retention System,
W79-02317 5G

WASTE TREATMENT

Acid Mine Drainage and Subsidence: Effects of Increased Coal Utilization,
W79-02409 5G

Partial Characterization of Chlorinated Organics in Superchlorinated Septages and Mixed Sludges,
W79-02413 5D

Assessment of Hazardous Waste Practices in the Petroleum Refining Industry,
W79-02440 5D

WASTE WATER

Hydrology and Water Budgets of Cypress Domes,
W79-02257 5B

WASTE WATER DISPOSAL

Stratigraphy and Hydrogeologic Correlation Studies in Several Cypress Domes-North Central Florida,
W79-02259 5E

Hydrology of the Austin Cary Control Dome,
W79-02260 5E

The Projected Cost of Cypress Wetland Disposal for Waldo, Florida,
W79-02286 5E

Cypress Growth Response in a Sewage-Enriched Pond Cypress Ecosystem,
W79-02287 5C

Adsorption of Poliovirus Type I to Wastewater Treatment Plant Solids,
W79-02446 5D

WASTE WATER (POLLUTION)

Waste Water Reclamation Apparatus,
W79-02341 5D

WASTE WATER TREATMENT

A Survey of Phosphorus and Nitrogen Levels in Treated Municipal Wastewater,
W79-02003 5A

EPA's Construction Grants Program: Perspectives Costs,
W79-02027 5G

Overseas Markets for the Water Industry - Nigeria,
W79-02030 5G

Economic Evaluation of Four Sludge Dewatering Devices,
W79-02037 5D

New Pulp Mill Strikes Low Profile.
W79-02102 5D

Involvement of Free Radicals in the Aqueous-Phase Catalytic Oxidation of Phenol Over Copper Oxide,
W79-02166 5D

Method and Apparatus for Removing Grit,
W79-02305 5D

Method of and Apparatus for Purifying Fluids with Radioactive Impurities,
W79-02307 5D

Continuous Treatment of Liquid Effluent and Sewage,
W79-02310 5D

Separation of an Aqueous or Water-Miscible Liquid from a Fluid Mixture,
W79-02311 5D

Method of Clarifying Industrial Waste Water,
W79-02312 5D

Process for Reducing the Mercury Content of Industrial Waste Waters,
W79-02313 5D

Method for Treating a Medium Containing Water with Coagulants,
W79-02322 5D

Process for the Preparation of a Substantially Homogeneous Lime Water solution,
W79-02323 5D

Method of Treating a Waste Liquid Containing Polluting Compounds,
W79-02324 5D

Drainage Device for Particulate Material,
W79-02326 5D

Liquid Level Control System for Separation Tank,
W79-02327 5D

Polyquaternary Compounds for the Control of Microbiological Growth,
W79-02331 5D

Filration System,
W79-02332 5D

Desalination Reverse Osmotic Membranes and Their Preparation,
W79-02338 3A

Grease Separator,
W79-02342 5D

Waste Fluid Treatment System,
W79-02343 5D

Planning and Startup of a Flexible Activated Sludge Installation (Bioflex Process) as a Biological Clarification Stage in a Board Mill (Planung und Inbetriebnahme einer flexiblen Belebtschlammanlage (Bioflex-Verfahren) als biologische Klaerstufe einer Kartonfabrik),
W79-02361 5D

Screening -- A Novel Approach to Primary Treatment,
W79-02363 5D

Operation of the (Effluent) Purification Equipment at the Razlog Pulp and Paper Mill (Opit ot rabota na prechisvatelnata stantsiya kem KTsKh Razlog),
W79-02367 5D

Use of the Activated Sludge Process in Purifying Waste Waters from Pulp Production, Especially Kraft Pulp Production (Anwendung des Belebtschlammverfahrens zur Reinigung von Abwaessern aus der Zellstoffproduktion, insbesondere der Sulfatzellstoffproduktion),
W79-02371 5D

Purification of Effluents of the Verkhotursk Wood Chemical Plant in Storage Ponds (Ochistka stochnykh vod Verkhoturskogo Lesokhimicheskogo Zavoda v prudu-nakopitele),
W79-02372 5D

Processing of Pulp and Paper Industry Waste by Reverse Osmosis for Pollution Control,
W79-02373 5D

Status and Methods for Effluent Purification in Pulp and Paper Mills (Stand und Verfahren der Restabwasserreinigung von Zellstoff- und Papierfabriken),
W79-02377 5D

Purification of Kraft Pulping Effluents by Electrochemical Oxidation (Ochistka stokov sul'fatno-tsellyuloznogo proizvodstva elektrokhimicheskim okisleniem),
W79-02380 5D

Chemical Foam Control During Effluent Treatment in Aeration Tanks (Khimicheskoe penogashenie pri ochistke stochnykh vod v aerotenkakh),
W79-02382 5D

Desalination in the Reuse of Industrial Waste Water,
W79-02383 5D

Nitrate Reduction by Denitrifying Bacteria in Single and Two Stage Continuous Flow Reactors,
W79-02406 5D

Manpower Utilization and Future Needs of Manufacturing Industries in Water Pollution Control,
W79-02438 5G

Wastewater Treatment Technology Documentation for Toxaphene Manufacture,
W79-02439 5D

Wastewater Treatment Technology Documentation for DDT Manufacture,
W79-02444 5D

Benzidine: Wastewater Treatment Technology,
W79-02445 5D

Adsorption of Poliovirus Type I to Wastewater Treatment Plant Solids,
W79-02446 5D

Fish Farms are Having to Watch Their Waste.
W79-02474 5G

WASTEWATER TREATMENT

Coordinating Public Utility Expansion, Industrial Siting and Pollution Control: A Working Dynamic Programming Algorithm,
W79-02039 5G

WATER ALLOCATION (POLICY)

Urban Water: Access, Delivery and Institutional Scarcity,
W79-02036 6E

Water Utilization and Reallocation in Chile: A Study of the Pirque Valley,
W79-02053 6B

WATER ANALYSIS

Measurement of Chelating Agent Levels in Media with High Concentrations of Interfering Metal Ions,
W79-02079 5A

Atomic Absorption Detector for Chromium Organometallic Compounds Separated by High Speed Liquid Chromatography,
W79-02080 5A

Origins of Water and Solutes in the Geopressured Zones of the Northern Gulf of Mexico Basin,
W79-02131 2K

Chemical Quality of Ground Water in Fairfax County, Virginia,
W79-02133 7C

Anion Exchange Method for the Determination of Plutonium in Water: Single-Laboratory Evaluation and Interlaboratory Collaborative Study,
W79-02145 5A

Analyses of Paper Machine Waters with Ion Specific Electrodes. Part V. Sulfide Determination Using Ag(+) Ion Specific Electrode and Various Measurement Methods,
W79-02388 5A

Evaluation of Semipermeable Membranes for Concentration or Organic Contaminants in Drinking Water,
W79-02405 5A

Comparison of Methods for the Determination of Total Available Residual Chlorine in Various Sample Matrices,
W79-02412 5A

WATER BALANCE

Analysis of Error in the Determination of Snow Storage for Small High Arctic Basins,
W79-02197 2C

WATER BUDGETS

Brook: A Hydrologic Simulation Model for Eastern Forests,
W79-02448 4D

WATER CHEMISTRY

Interstital Water Chemistry of Anoxic Long Island Sound Sediments. 2. Nutrient Regeneration and Phosphate Removal,
W79-02243 5C

WATER CONSERVATION

The Economics of Water Conservation,
W79-02022 3D

Drip Study Shows up to 30% Water Savings,
W79-02090 3F

Characterization and In-Plant Reduction of Wastewater from Hog Slaughtering Operations,
W79-02298 5D

WATER CONSUMPTION (EXCEPT CONSUMPTIVE USE)

An Analysis of Network Costs: A Study of Sydney's Water Supply from 1890 to 2001, Part I: Research Methods,
W79-02033 6B

WATER CONTENT

Water Infiltration into Uniform and Stratified Soils I. Review and Use of an Approximate Theory,
W79-02492 2G

Water Infiltration into Uniform and Stratified Soils II. Experimental Evaluation of an Approximate Theory,
W79-02493 2G

WATER FLOODING

Improved Techniques for Evaluating Carbonate Waterfloods in West Texas,
W79-02182 4B

WATER FLOW

Electrical Potentials During Water Entry into an Air-Dry Mixture of Sand and Kaolinite,
W79-02357 2G

WATER HYACINTH
The Colonization of Cabora Bassa, Mocambique, A New Man-Made Lake, by Floating Aquatic Macrophytes,
W79-02231 4A

WATER INFILTRATION
Water Infiltration into Uniform and Stratified Soils I. Review and Use of an Approximate Theory,
W79-02492 2G

Water Infiltration into Uniform and Stratified Soils II. Experimental Evaluation of an Approximate Theory,
W79-02493 2G

WATER LAW
The Idaho and Montana Procedures for Obtaining Water Use Permits--Possible Sources for Improvement of Wyoming Law, Comments,
W79-02082 6E

Changing Manner and Place of Use of Water Rights in Wyoming, Comments,
W79-02083 6E

Procedural Inconsistencies and Substantive Issues in the Federal Reserved Water Rights Doctrine. Case Note, United States v. Akin, 504 F.2d 115 (10th Cir. 1974),
W79-02084 6E

Land Use and Rights in Groundwater. Case Note, Alameda County Water District v. Niles Sand and Gravel Co., 37 Cal.App. 3d 924, 112 Cal.Rptr. 846 (Ct.App. 1974), cert. denied, U.S. 95 S.Ct. 128 (1974),
W79-02085 6E

WATER LEVEL FLUCTUATIONS
Water Level Fluctuation in a Northeastern Ontario Peatland,
W79-02105 2H

The Productivity of Lake Champlain wit Regard to Waterfowl, Furbearers, and Other Wildlife,
W79-02114 2H

Long-Period Ground-Water Regime in the Excessively Wet Zone of the European USSR,
W79-02212 2F

WATER LEVELS
Model Aids Planners in Predicting Rising Ground-Water Levels in San Bernadino, California,
W79-02173 4B

WATER MANAGEMENT (APPLIED)
A Simulation Model for Phytoplankton Growth and Nutrient Cycling in Eutrophic, Shallow Lakes,
W79-02008 5C

Aquatic Plant Management in Semi-Natural Streams: The Role of Marginal Vegetation,
W79-02012 5G

The Economics of Water Conservation,
W79-02022 3D

Measurement of Economic Uncertainty in Public Water Resource Development: An Extension,
W79-02050 6B

Planning and Modeling in Urban Water Management,
W79-02288 6B

Profile and Measurement of Social Well-Being Indicators for Use in the Evaluation of Water and Related Land Management Planning,
W79-02344 6B

WATER PERMITS
The Idaho and Montana Procedures for Obtaining Water Use Permits--Possible Sources for Improvement of Wyoming Law, Comments,
W79-02082 6E

WATER POLICY
The Effects of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-02498 5G

WATER POLLUTION
Source Assessment: Water Pollutants From Coal Storage Areas,
W79-02144 5B

Underground Injection Control Program Studied,
W79-02184 5G

Process for Recovering Proteinaceous Matter from Acid Whey and Tannery Unhairing Effluents,
W79-02334 5D

Scanning Apparatus for Septic Effluents,
W79-02340 5D

Asbestos in the Water Supplies of the Ten Regional Cities, Part I,
W79-02441 5A

WATER POLLUTION CONTROL
Overseas Markets for the Water Industry - Nigeria,
W79-02030 5G

The Business of Pollution Control - A Bed of Roses or Thorns.
W79-02044 5G

Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

Best Management Practices to Control Nonpoint-Source Pollution from Agriculture,
W79-02233 5G

Progress Repot on Moscuitoe Research: Cypress Domes,
W79-02281 5G

Device for Measuring pH and Temperature of a Liquid, Which Includes a Memory,
W79-02316 5A

Possibility of Rendering Bleachery Effluents Harmless by Technological Changes (Ueber die Moeglichkeit Bleichereiabwaesser durch technologische Aenderungen unschaedlich zu machen),
W79-02360 5G

Possibilities and Measures in the Pulp Industry in the Interest of Environmental Protection (Moeglichkeiten und Massnahmen der Zellstoffindustrie im Interesse des Umweltschutzes).
W79-02369 5G

Pulp Industry and Water Pollution Control (Zellstoffindustrie und Gewaesserschutz),
W79-02370 5G

Possibilities for Reducing COD and 5-Day BOD in Waste Waters from the Pulp and Viscose Rayon Fiber Industries (Moeglichkeiten zur Reduktion des CSB und BSB(5) in den Abwaessern der Zellstoff- und Viskosefaserindustrie),
W79-02376 5D

Interim Recommendation for the Use of Buffer Strips for the Protection of Small Streams in the Maritimes,
W79-02384 5G

Analysis of the Environmental Control Technology for Oil Shale Development,
W79-02432 5G

Storm and Combined Sewer Pollution Control Program Reports. Research, Development, and Demonstration Grant, Contract, and In-House Project Reports.
W79-02442 5G

The Effects of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-02498 5G

WATER POLLUTION EFFCTS
Water Quality of Cypress Domes: Routine Sampling Program,
W79-02269 5C

WATER POLLUTION EFFECTS
Environmental Impact Assessment: An Aquatic Biologist's Point of View,
W79-02222 6G

Changes in Understory Vegetation in Cypress Domes Brought About by Fire and Addition of Sewage,
W79-02263 5C

Air Emissions from Cypress Swamps,
W79-02266 5C

The Response of Benthic Invertebrate Populations to Sewage Addition,
W79-02267 5C

Coliform Monitoring of Waters Associated with the Cypress Dome Project,
W79-02268 5C

Denitrification and Surface Runoff in the Experimental Domes: Cypress Wetlands,
W79-02270 5C

Rates of Growth and Nutrient Concentrations of Trees in Cypress Domes,
W79-02271 5C

Growth Rates of Seedlings Planted in Cypress Domes,
W79-02272 5C

Effect of Sewage Effluent in Cypress Ponds on Surrounding Soil Moisture and Nutrient Content and on Growth of Pine Trees (Summary of MS Thesis),
W79-02273 5C

Effect of Sewage Effluent in Cypress Ponds on Growth of Surrounding Pine Seedlings and Trees,
W79-02274 5C

Sedimentation Rates: Cypress Domes,
W79-02275 5C

Nitrogen Transformations in Water and Sediments of Cypress Domes with and without Added Sewage Effluent,
W79-02276 2H

The Effects of Perturbation on Cypress Dome Animal Communities,
W79-02279 5C

Comparison of Fall Birds Present in a Natural Cypress Dome, and the Adjacent Pine Plantation,
W79-02280 5C

The Effects of Petroleum on the Salt Marsh Ecosystem,
W79-02485 5C

WATER POLLUTION SOURCE
A Material Balance Study of Polychlorinated Biphenyls in Lake Michigan,
W79-02017 5C

WATER POLLUTION SOURCES

Effects of Forest Workings on Streamflow and Water Quality (Part I),
W79-02005 5C

Water Quality in the Old Plantation Water Control District, Broward County, Florida-Progress Report, July 1976-June 1977,
W79-02127 5B

Mass Balance Determinations for Pollutants in Urban Regions. Methodology with Applications to Lead, Zinc, Cadmium, and Arsenic.
W79-02148 5A

A Systematic Procedure for Taxing Agricultural Pollution Sources,
W79-02219 5G

A Computer Simulation of Phosphate and Nitrogen Transport by Water Runoff,
W79-02251 5B

Advances in Storm and Combined Sewer Pollution Control Abatement Technology,
W79-02437 5D

Virus Transport Through Solid Beds,
W79-02447 5B

WATER POLLUTION TREATMENT

Oil Sorbing Mat,
W79-02309 5G

Oil Salvager,
W79-02315 5G

Apparatus for Collecting Debris Floating in a Stream,
W79-02328 5G

Gravitational Separator for Mixtures of Immiscible Liquids of Different Densities,
W79-02336 5D

Device for the Removal of a Liquid Layer on Water,
W79-02337 5G

Grease Separator,
W79-02342 5D

Treatment Effectiveness for the Removal of Selected Contaminants from Drinking Water,
W79-02435 5F

WATER PURIFICATION

Water Purifier,
W79-02308 5F

Method of Clarifying Industrial Waste Water,
W79-02312 5D

Home Water Distiller,
W79-02319 5F

Method for Treating a Medium Containing Water with Coagulants,
W79-02322 5D

Process for the Preparation of a Substantially Homogeneous Lime Water solution,
W79-02323 5D

Reverse Osmosis Water Unit,
W79-02329 5F

Water Treatment Apparatus and Method,
W79-02333 5F

WATER QUALITY

Water Quality Can Affect Management Planning,
W79-02096 5G

Limnology of Selected Lakes in Ohio - 1975,
W79-02126 2H

Geology and Groundwater Resources of Northern Berks County, Pennsylvania,
W79-02132 2F

Chemical Quality of Ground Water in Fairfax County, Virginia,
W79-02133 7C

Major Aquifers in Clark County, South Dakota,
W79-02134 2F

Water Resources Data for Washington, Water year 1977--Volume 1. Western Washington.
W79-02138 7C

Water Resources Data for Washington, Water year 1977--Volume 2. Eastern Washington.
W79-02139 7C

Water Resources Data for Tennessee, Water Year 1977.
W79-02140 7C

Water Resources Data for Georgia, Water Year 1977.
W79-02141 7C

Instruments for Monitoring the Quality of Natural and Waste Waters,
W79-02214 5A

Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay,
W79-02223 5C

An Evaluation of Isotope Concentrations in the Ground Water of Saudi Arabia,
W79-02254 2F

Preliminary Evaluation of Final Cut Lakes,
W79-02292 5G

Range Cattle Impacts on Stream Water Quality in the Colorado Front Range,
W79-02386 5G

Precipitation and Runoff Water Quality from an Urban Parking Lot and Implications for Tree Growth,
W79-02387 5B

Water-Quality Monitoring in the American Urbanizing Southwest,
W79-02397 5B

Water Quality of Streamflow from Forested Watersheds on Sedimentary Soils,
W79-02404 5B

WATER QUALITY CONTROL

Oil Salvager,
W79-02315 5G

Home Water Distiller,
W79-02319 5F

Apparatus for Collecting Debris Floating in a Stream,
W79-02328 5G

Novel Compositions of Matter for Use in the Treatment of Aqueous Systems,
W79-02335 5F

Gravitational Separator for Mixtures of Immiscible Liquids of Different Densities,
W79-02336 5D

Device for the Removal of a Liquid Layer on Water,
W79-02337 5G

Desalination Reverse Osmotic Membranes and Their Preparation,
W79-02338 3A

The Effects of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-02498 5G

WATER QUALITY STANDARDS

Handling and Disposal of Sludges from Combined Sewer Overflow Treatment. Phase II - Impact Assessment,
W79-02303 5D

Manpower Utilization and Future Needs of Manufacturing Industries in Water Pollution Control,
W79-02438 5G

The Effects of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-02498 5G

WATER RESOURCES

Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W79-02123 10D

WATER RESOURCES DEVELOPMENT

Issues in Water Development Decisions: A Discussion Paper,
W79-02042 6B

Measurement of Economic Uncertainty in Public Water Resource Development: An Extension,
W79-02050 6B

Geographic Aspects of the Territorial Redistribution of Water Resources,
W79-02209 4A

WATER RESOURCES PLANNING

Planning and Modeling in Urban Water Management,
W79-02288 6B

WATER REUSE

Waste Water Reclamation Apparatus,
W79-02341 5D

Possibility of Rendering Bleachery Effluents Harmless by Technological Changes (Ueber die Moeglichkeit Bleichereiabwaesser durch technologische Aenderungen unschaedlich zu machen),
W79-02360 5G

WATER RIGHTS

Water Utilization and Reallocation in Chile: A Study of the Pirque Valley,
W79-02053 6B

Changing Manner and Place of Use of Water Rights in Wyoming, Comments,
W79-02083 6E

Procedural Inconsistencies and Substantive Issues in the Federal Reserved Water Rights Doctrine. Case Note, United States v. Akin, 504 F.2d 115 (10th Cir. 1974),
W79-02084 6E

Land Use and Rights in Groundwater. Case Note, Alameda County Water District v. Niles Sand and Gravel Co., 37 Cal.App. 3d 924, 112 Cal.Rptr. 846 (Ct.App. 1974), cert. denied, U.S. 95 S.Ct. 128 (1974),
W79-02085 6E

Evapotranspiration Estimates for Water Right Transfers,
W79-02491 2D

WATER SAMPLING

Asbestos in the Water Supplies of the Ten Regional Cities, Part I,
W79-02441 5A

WATER SHORTAGE
An Economic Approach to Water Supply Planning in Southeastern Virginia,
W79-02294 6B

WATER STORAGE
Fresh Water Supply and Waste Water Retention System,
W79-02317 5G

WATER STRESS
Physiological Aspects of Water Use Efficiency,
W79-02449 2I

WATER SUPPLY
Financing System Changes,
W79-02023 6C

Structuring Water Utility Bond Issues to Cope with Inflation,
W79-02024 6C

An Analysis of Network Costs: A Study of Sydney's Water Supply from 1890 to 2001, Part I: Research Methods,
W79-02033 6B

Urban Water: Access, Delivery and Institutional Scarcity,
W79-02036 6E

Public Groundwater Supplies in Kane County,
W79-02075 4B

Dual Water Supplies: An Idea for the Future,
W79-02175 3D

Water Systems Basics, (1),
W79-02180 8C

Innovative Water System Solves Quality Problem,
W79-02183 5G

Management of Rural Water Supply Peak Flow Rates,
W79-02194 3D

An Economic Approach to Water Supply Planning in Southeastern Virginia,
W79-02294 6B

WATER TABLE
Long-Period Ground-Water Regime in the Excessively Wet Zone of the European USSR,
W79-02212 2F

Land Subsidence Due to Water Withdrawal in the Vicinity of Pecos, Texas,
W79-02396 4B

WATER TEMPERATURE
The Impact of the Use of Heat Pumps on Groundwater Temperatures,
W79-02192 4B

Thermal Tolerance and Preference of the Indian Catfish Heteropneustes Fossilis,
W79-02455 5C

Ecological Effects of Cooling Water of a Power Plant at Kiel Fjord,
W79-02461 5C

Effects of Some Environmental Factors on Growth and Food Consumption of the Baltic Palaemonid Shrimp, Palaemon Adspersus Var. Fabricii (Rathke),
W79-02465 5C

The Influence of Salinity and Temperature on Growth, Metabolism and Lethal Temperature of the Sand Goby, Pomatoschistus Microps K. (Der Einfluss Von Salzgehalt und Temperatur Auf Wachstum Stoffwechsel und Letaltemperatur Der Strandgrundel Pomatoschistus Microps K.),
W79-02466 5C

Studies on the Effects of the Environment on the Heart Rate of Shellfishes. II. Effects of Temperature, Low Salinity and Hypoxia on the Heart Rate of an Abalone Haliotis (Nordotis) Discus Hannai Ino. (In Japanese),
W79-02497 5C

WATER TRANSFER
Geographic Aspects of the Territorial Redistribution of Water Resources,
W79-02209 4A

Evapotranspiration Estimates for Water Right Transfers,
W79-02491 2D

WATER TREATMENT
Copper Sulfate Helps Control Micorganisms in Reservoirs,
W79-02018 5F

The Occurrence and Removal of Nitrogen in Subsurface Agricultural Drainage from the San Joaquin Valley, California,
W79-02107 5G

Water Purifier,
W79-02308 5F

Home Water Distiller,
W79-02319 5F

Method for Treating a Medium Containing Water with Coagulants,
W79-02322 5D

Reverse Osmosis Water Unit,
W79-02329 5F

Water Treatment Apparatus and Method,
W79-02333 5F

Novel Compositions of Matter for Use in the Treatment of Aqueous Systems,
W79-02335 5F

Treatment Effectiveness for the Removal of Selected Contaminants from Drinking Water,
W79-02435 5F

WATER USE EFFICIENCY
Physiological Aspects of Water Use Efficiency,
W79-02449 2I

WATER UTILIZATION
Water Utilization and Reallocation in Chile: A Study of the Pirque Valley,
W79-02053 6B

Major Aquifers in Clark County, South Dakota,
W79-02134 2F

Surface Water VS. Ground Water,
W79-02176 4B

Characterization and In-Plant Reduction of Wastewater from Hog Slaughtering Operations,
W79-02298 5D

Physiological Aspects of Water Use Efficiency,
W79-02449 2I

WATER VAPOR
Ion Mobilities in Pure Water Vapour at Saturation,
W79-02076 1B

WATER WELLS
Two Drilling Methods Compared,
W79-02169 8B

The Downhole TV Camera Can 'See' What's Wrong,
W79-02178 8G

Water Systems Basics, (1),
W79-02180 8C

Subsurface Stratigraphy and Water Resources of Cass County, Indiana,
W79-02185 4B

Transient Spherical Flow to a Nonpenetrating Well with Constant Drawdown,
W79-02191 4B

WATER YIELD
Brook: A Hydrologic Simulation Model for Eastern Forests,
W79-02448 4D

WATER YIELD IMPROVEMENT
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

WATERFLOODS
Improved Techniques for Evaluating Carbonate Waterfloods in West Texas,
W79-02182 4B

WATERFOWL
Aquatic Invertebrate Abundance in Relation to Changing Marsh Vegetation,
W79-02095 2H

WATERSHED MANAGEMENT
Magnitude and Frequency of Flooding on the Myakka River, Southwest Florida,
W79-02129 4A

WATERSHEDS (BASINS)
Brook: A Hydrologic Simulation Model for Eastern Forests,
W79-02448 4D

WEATHERING
The Nature of Basalt Weathering in Israel,
W79-02238 2G

WEIBULL PROBABILITY DISTRIBUTION
Measurement of Economic Uncertainty in Public Water Resource Development: An Extension,
W79-02050 6B

WEIRS
Liquid Level Control System for Separation Tank,
W79-02327 5D

Hydraulic Model Tests of the Proposed Weir for the Richelieu River at St. Jean, Quebec,
W79-02414 8C

WELFARE (ECONOMICS)
A Note on the Welfare-Economic Consequences of Extended Fishing Limits,
W79-02047 6E

The Economic Consequences of the 200-Mile Seabed Zone: The Replenishable Resources Case,
W79-02048 6E

General Equilibrium with a Replenishable Natural Resource,
W79-02068 6B

WELL CASINGS
Drillers Find Increasing Use for Plastic Pipe,
W79-02177 8G

WELL CONSTRUCTION
Drillers Find Increasing Use for Plastic Pipe,
W79-02177 8G

WELLS
Transient Spherical Flow to a Nonpenetrating Well with Constant Drawdown,
W79-02191 4B

WEST GERMANY
Status and Methods for Effluent Purification in Pulp and Paper Mills (Stand und Verfahren der Restabwasserreinigung von Zellstoff- und Papierfabriken),
W79-02377 5D

WESTERN GRAND CANYON (ARIZ)
Holocene Faulting in the Western Grand Canyon, Arizona,
W79-02496 2J

WESTERN WASHINGTON
Water Resources Data for Washington, Water year 1977--Volume 1. Western Washington.
W79-02138 7C

WETLANDS
An Examination of Legislation for the Protection of the Wetlands of the Atlantic and Gulf Coast States,
W79-02106 6E

A Bibliography of Maryland's Tidal Wetlands (Marshes-Swamps),
W79-02111 2L

Forested Wetlands of Florida-Their Management and Use,
W79-02112 6B

The Productivity of Lake Champlain wit Regard to Waterfowl, Furbearers, and Other Wildlife,
W79-02114 2H

Hydrologic Budget Model,
W79-02258 2H

Denitrification and Surface Runoff in the Experimental Domes: Cypress Wetlands,
W79-02270 5C

Evaluation Models for Public Management of Freshwater Wetlands,
W79-02401 6B

Identification and Delineation of Freshwater Wetland Values,
W79-02402 6B

Diurnal Use of Small Wetlands by Ducks,
W79-02418 2I

Wetland Road Crossing: Drainage Problems and Timber Damage,
W79-02421 4C

The Release of Plant Nutrients from Reed Borders and its Transport into the Open Waters of the Bodensee-Untersee, (In German),
W79-02422 5C

Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands: Soil Relationships,
W79-02429 6G

WHEAT
Ammonium Effects on Nutrient Cation Absorption by Wheat,
W79-02021 3F

Growth and Yield of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02035 3F

Plant Water Relationships of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02043 3F

Tillage Effects on Winter Wheat Production Where the Irrigated and Dryland Crops are Alternated,
W79-02088 3F

WILDERNESS AREAS
Economics of Wilderness Resources,
W79-02072 6B

WILDLIFE HABITAT
The Productivity of Lake Champlain wit Regard to Waterfowl, Furbearers, and Other Wildlife,
W79-02114 2H

Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

WIND
Surface Drifter Movements Observed in Port Angeles Harbor and Vicinity, April 1978,
W79-02221 2L

WIND VELOCITY
Wind, Sprinkler Patterns, and System Design,
W79-02368 3F

WINDBREAKS
Growth and Yield of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02035 3F

Plant Water Relationships of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02043 3F

WINDS
Wind Induced Dispersion and Algal Growth in Shallow Lakes,
W79-02226 5G

WINTER HABITATS (TROUT)
Telemetric Determination of Salmonid Winter Micro-Habitat Occupation and Movement in Ice-Covered Streams,
W79-02157 7B

WISCONSIN
The Role of Silica and the Vernal Diatom Bloom in Controlling the Growth of Nuisance Algal Populations in Lakes,
W79-02152 5C

Increasing Efficiency of Aquatic Plant Management Through Processing,
W79-02158 4A

The Impact of the Use of Heat Pumps on Groundwater Temperatures,
W79-02192 4B

WYOMING
The Idaho and Montana Procedures for Obtaining Water Use Permits--Possible Sources for Improvement of Wyoming Law, Comments,
W79-02082 6E

Changing Manner and Place of Use of Water Rights in Wyoming, Comments,
W79-02083 6E

Lawn Sprinkler Distribution Patterns,
W79-02155 3F

Telemetric Determination of Salmonid Winter Micro-Habitat Occupation and Movement in Ice-Covered Streams,
W79-02157 7B

XYLEM
Simulated Flow Through the Root Xylem,
W79-02199 2I

YELLOWSTONE NATIONAL PARK
Tritium in the Waters of Yellowstone National Park,
W79-02130 2F

ZINC
Zinc Nutrition of Rice as Influenced by Rates of Gypsum and Zn Fertilizaton of Alkali Soils,
W79-02099 3F

New Membranes for Treating Metal Finishing Effluents by Reverse Osmosis,
W79-02300 5D

Mechanism of Zinc Adsorption by Iron and Aluminum Oxides,
W79-02359 2K

Reaction Products and Solubility of Applied Zinc Compounds in Some Manitoba Soils,
W79-02362 2K

ZONE OF AERATION
Computation of Soil Freezing Depth in the Zone of Aeration,
W79-02215 2C

ZOOPLANKTON
Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

Application of a Model of Zooplankton Composition to Problems of Fish Introductions to the Great Lakes,
W79-02020 5C

Release of Dissolved Organic Carbon by Grazing Zooplankton,
W79-02234 5C

Polychlorinated Biphenyls in Coastal Marine Zooplankton: Bioaccumulation by Equilibrium Partitioning,
W79-02242 5C

Recent Changes in Plankton Communities and Present Trophic State of Lake Steinsfjord,
W79-02250 5C

The Crustacean Zooplankton of Grasmere Before and After a Change in Sewage Effluent Treatment,
W79-02458 5C

Ecological Effects of Cooling Water of a Power Plant at Kiel Fjord,
W79-02461 5C

ZOOXANTHELLAE
The Uptake, Retention, and Release of Ammonium by Reef Corals,
W79-02228 5C

AUTHOR INDEX

AGRON, N. A.
Hula Valley Peat: Review of Chemical and Geochemical Aspects,
W79-02365 2K

AKIYA, F.
Desalination Reverse Osmotic Membranes and Their Preparation,
W79-02338 3A

ALLEE, D.
Studying the Economics of a Waterway: A Critique of Studies of the McClellan-Kerr Arkansas River Navigation System,
W79-02052 6B

ALLEE, D. J.
Is It Time to Do a Benefit-Cost Analysis for the Location of a Power Plant,
W79-02054 6B

ALLINSON, J.
Coliform Monitoring of Waters Associated with the Cypress Dome Project,
W79-02268 5C

ALLUM, M. O.
A Survey of Phosphorus and Nitrogen Levels in Treated Municipal Wastewater,
W79-02003 5A

AMBERGER, A.
A Computer Simulation of Phosphate and Nitrogen Transport by Water Runoff,
W79-02251 5B

ANDERSEN, K. P.
A Model of the Biological Effects of Eutrophication in the North Sea,
W79-02469 5C

ANDERSON, F. O.
Primary Production in a Shallow Water Lake with Special Reference to a Reed Swamp,
W79-02103 5C

ANDERSON, L. G.
'The Relationship Between Firm and Fishery in Common Property Fisheries': Reply,
W79-02061 6B

ANDERSON, L. W. J.
Role of Inorganic Ions in Controlling Sedimentation Rate of a Marine Centric Diatom Ditylum Brightwelli,
W79-02014 5C

ANDERSON, W. B.
An Economic Approach to Water Supply Planning in Southeastern Virginia,
W79-02294 6B

ANDREWS, C. B.
The Impact of the Use of Heat Pumps on Groundwater Temperatures,
W79-02192 4B

ANGELL, C. A.
Supercooling of Water to -92 Degrees C Under Pressure,
W79-02494 2C

ANISIMOVA, M. I.
Purification of Kraft Pulping Effluents by Electrochemical Oxidation (Ochistka stokov sul'fatno-tsellyuloznogo proizvodstva elektrokhimicheskim okisleniem),
W79-02380 5D

ANTIE, D. A.
Effect of Dissolved Oxygen and Redox Potential and Nitrate Removal in Flooded Swamp and Marsh Soils,
W79-02426 5C

ARAI, S.
Desalination Reverse Osmotic Membranes and Their Preparation,
W79-02338 3A

ARDAKANI, M. S.
Reduction of Nitrate in a Soil Column During Continuous Flow,
W79-02366 2G

ARMSTRONG, J. M.
Tire Module Systems in Shore and Harbor Protection,
W79-02201 8G

ARMSTRONG, W. B.
Redox Potential Measurements as an Indication of Biochemical Well Plugging,
W79-02170 5A

ARRINGTON, J. R.
Waste Fluid Treatment System,
W79-02343 5D

ASARE, F.
A Statistical Evaluation of Some Columbia River Basalt Chemical Analysis,
W79-02433 5A

ASSEED, M.
Water Infiltration into Uniform and Stratified Soils I. Review and Use of an Approximate Theory,
W79-02492 2G

Water Infiltration into Uniform and Stratified Soils II. Experimental Evaluation of an Approximate Theory,
W79-02493 2G

AUSTERN, B. M.
Partial Characterization of Chlorinated Organics in Superchlorinated Septages and Mixed Sludges,
W79-02413 5D

AVERY, S. T.
Oxygen Transfer at Hydraulic Structures,
W79-02202 5G

AZIMOV, S. G.
Computation of the Concentration of Substances in Rivers and Canals,
W79-02206 5B

BABKIN, V. A.
Purification of Kraft Pulping Effluents by Electrochemical Oxidation (Ochistka stokov sul'fatno-tsellyuloznogo proizvodstva elektrokhimicheskim okisleniem),
W79-02380 5D

BAGUR, J. D.
Barrier Islands of the Atlantic and Gulf Coasts of the United States: An Annotated Bibliography,
W79-02113 2L

BARLOW, E. W. R.
Protein Production Rates by Algae Using Swine Manure as a Substrate,
W79-02489 5D

BARMAN, E. H. JR.
Aquatic Vascular Plants of Lake Apopka, Florida,
W79-02420 2I

BARTHELMES, D.
Influence of Silver Carp (Hypophtalmichthys Molitrix) on Plankton of Shallow Waters According to Investigations in Carp Ponds (Wirkungen Von Silberkarpfen (Hypophthalmichtmys Molitrix) Auf Das Plankton in Flachcewassern Nach Untersuchungen in Karpfenteichen),
W79-02457 5C

BATES, E. R.
Acid Mine Drainage and Subsidence: Effects of Increased Coal Utilization,
W79-02409 5G

BEATY, E. R.
Differential Effect of Bermuda and Bahiagrasses on Soil Chemical Characteristics,
W79-02381 3F

BEAUCHAMP, J. J.
Bioaccumulation Potential and Acute Toxicity of Synthetic Fuels Effluents in Freshwater Biota: Azaarenes,
W79-02241 5C

BEELAND, G. V.
Survey of Environmental Regulations Applying to Geothermal Exploration, Development, and Use,
W79-02410 5G

BEESE, F.
The Behavio of Sulfate on Salt Input in Podzolic Brown Earth,
W79-02321 2K

BEL'CHIKOV, V. A.
Forecast of the Flash Flood Hydrograph on the Ingoda River,
W79-02207 4A

BELSER, L. W.
Reduction of Nitrate in a Soil Column During Continuous Flow,
W79-02366 2G

BELYAKOV, V. B.
Instruments for Monitoring the Quality of Natural and Waste Waters,
W79-02214 5A

BELYAYEV, A. V.
Complex Relations Between the Hydrologic Budget of the Major Geographic Zones of the Earth,
W79-02208 2A

BENDER, D. F.
Comparison of Methods for the Determination of Total Available Residual Chlorine in Various Sample Matrices,
W79-02412 5A

BENNETT, E. R.
Pollutional Characteristics of Stormwater Runoff,
W79-02451 5B

BENNETT, J. M.
Physiological Aspects of Water Use Efficiency,
W79-02449 2I

BEPPLER, T. O.
Procedural Inconsistencies and Substantive Issues in the Federal Reserved Water Rights Doctrine. Case Note, United States v. Akin, 504 F.2d 115 (10th Cir. 1974),
W79-02084 6E

BERESKIN, F. P.
Grease Separator,
W79-02342 5D

BERGHOLZ, W. E. JR.
Land Use and Rights in Groundwater. Case Note, Alameda County Water District v. Niles Sand and Gravel Co., 37 Cal.App. 3d 924, 112 Cal.Rptr. 846 (Ct.App. 1974), cert. denied, U.S. 95 S.Ct. 128 (1974),
W79-02085 6E

BERK, S. G.
Effects of Ingesting Mercury-Containing Bacteria on Mercury Tolerance and Growth Rates of Ciliates,
W79-02499 5C

BERLING, R. L.
Disaster Response to Flash Flood,
W79-02193 8B

BERNER, R. A.
Interstital Water Chemistry of Anoxic Long Island Sound Sediments. 2. Nutrient Regeneration and Phosphate Removal,
W79-02243 5C

BERTHOUEX, P. M.
Characterization and In-Plant Reduction of Wastewater from Hog Slaughtering Operations,
W79-02298 5D

BETANCOURT, O. J.
Filration System,
W79-02332 5D

BEUTLER, B.
Assessment of Hazardous Waste Practices in the Petroleum Refining Industry,
W79-02440 5D

BICKING, C.
Procedure for the Evaluation of Environmental Monitoring Laboratories,
W79-02149 5A

BILLEN, G.
A Budget of Nitrogen Recycling in North Sea Sediments off the Belgian Coast,
W79-02245 5C

BILLINGS, W. D.
Root Production and Root Turnover in a Wet Tundra Ecosystem, Barrow, Alaska,
W79-02100 2I

BISHOP, C. T.
Anion Exchange Method for the Determination of Plutonium in Water: Single-Laboratory Evaluation and Interlaboratory Collaborative Study,
W79-02145 5A

BISSET, R.
Quantification, Decision-Making and Environmental Impact Assessment in the United Kingdom.
W79-02028 6G

BJERK, J. E.
Organchlorines in Codfish from Harbours Along the Norwegian Coast,
W79-02479 5C

BLACKWOOD, T. R.
Source Assessment: Water Pollutants From Coal Storage Areas,
W79-02144 5B

BLISS, J. D.
Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

BLOSSER, R. O.
Investigations of Heat Treatment for Paper Mill Sludge Conditioning,
W79-02296 5E

BLOUNT, A. E.
The Urquiola Oil Spill, La Coruna, Spain: Impact and Reaction on Beaches and Rocky Coasts,
W79-02500 5C

BOELTER, D. H.
Minnesota's Peat Resources: Their Characteristics and Use in Sewage Treatment, Agriculture, and Energy,
W79-02255 5G

BOERSMA, L.
Protein Production Rates by Algae Using Swine Manure as a Substrate,
W79-02489 5D

Yield Response to Soil Warming: Agronomic Crops,
W79-02490 3F

BOIKO, N. A.
Purification of Effluents of the Verkhotursk Wood Chemical Plant in Storage Ponds (Ochistka stochnykh vod Verkhoturskogo Lesokhimicheskogo Zavoda v prudu-nakopitele),
W79-02372 5D

BOISSEAU, D. B.
Ammonium Oxidation and its Significance in the Summer Cycling of Nitrogen in Oxygen Depleted Skan Bay, Unalaska Islanda, Alaska,
W79-02004 5C

BOKUNIEWICZ, H. J.
Transportation and Accumulation of Fine-Grained Sediments in the Estuarine Environment: Recommendations for Research,
W79-02165 2L

BOLLYKY, L. J.
Ozone Treatment of Cyanide-Bearing Plating Waste,
W79-02299 5D

BOLTE, W. B.
Home Water Distiller,
W79-02319 5F

BOND, W. J.
The Colonization of Cabora Bassa, Mocambique, A New Man-Made Lake, by Floating Aquatic Macrophytes,
W79-02231 4A

BONDARCHIK, N. G.
Chemical Foam Control During Effluent Treatment in Aeration Tanks (Khimicheskoe penogashenie pri ochistke stochnykh vod v aerotenkakh),
W79-02382 5D

BONDE, E. K.
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

BONE, D. H.
Nitrate Reduction by Denitrifying Bacteria in Single and Two Stage Continuous Flow Reactors,
W79-02406 5D

BONNER, G. D.
Filration System,
W79-02332 5D

BOROWCZYK, J. J.
Grease Separator,
W79-02342 5D

BOTTOM, D.
Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay,
W79-02223 5C

BOWLES, D. S.
Stochastic Modeling for Predicting Frequency Distribution of Stages in Thermal Lakes at Future Planning Horizons,
W79-02495 4A

BOYD, J. H.
Optimization and Suboptimization in Fishery Regulation: Comment,
W79-02067 6B

BOYLEN, C. W.
Maximum Depth Inhabited by Aquatic Vascular Plants,
W79-02249 5C

BRADBURY, J. P.
A Paleolimnological Comparison of Burntside and Shagawa Lakes, Northeastern Minnesota,
W79-02295 5C

BRAINARD, E. C. II.
Scanning Apparatus for Septic Effluents,
W79-02340 5D

BRAMLETT, D. A.
Liquid Level Control System for Separation Tank,
W79-02327 5D

BRANDL, G.
Reciprocable Sprinkler,
W79-02318 3F

BREITNER, N. F.
Polychlorinated Biphenyls in Coastal Marine Zooplankton: Bioaccumulation by Equilibrium Partitioning,
W79-02242 5C

BRENNER, S.
Hula Valley Peat: Review of Chemical and Geochemical Aspects,
W79-02365 2K

BREVIK, E. M.
Organchlorines in Codfish from Harbours Along the Norwegian Coast,
W79-02479 5C

BREZONIK, P.
Denitrification and Surface Runoff in the Experimental Domes: Cypress Wetlands,
W79-02270 5C

BREZONIK, P. L.
Water Quality of Cypress Domes: Routine Sampling Program,
W79-02269 5C

BRIGHTMAN, R. S.
The Response of Benthic Invertebrate Populations to Sewage Addition,
W79-02267 5C

BROCK, T. D.
Use of Fluorescence Microscopy for Quantifying Phytoplankton, Especially Filamentous Blue-Green Algae,
W79-02239 5C

BROCK, W. A.
A Polluted Golden Age,
W79-02071 5G

BROOK, G. A.
The Origin of Labyrinth and Tower Karst and the Climatic Conditions Necessary for Their Development,
W79-02073 2F

BROSSET, C.
Atmospheric Formation, Dispersion, and Deposition of Acid Substances,
W79-02015 5A

BROWN, D. E.
Drainage Map of Arizona Showing Perennial Streams and Some Important Wetlands,
W79-02121 7C

BROWN, E. J.
Kinetics of Algal Transient Phosphate Uptake and the Cell Quota Concept,
W79-02237 5C

Kinetics of Phosphate Uptake by Aquatic Microorganisms: Deviations from a Simple Michaelis-Menten Equation,
W79-02016 5C

BROWN, G. M. JR.
Implications of Alternative Measures of Natural Resource Scarcity,
W79-02049 6B

BROWN, P. M.
Origins of Water and Solutes in the Geopressured Zones of the Northern Gulf of Mexico Basin,
W79-02131 2K

BROWN, R.
Anion Exchange Method for the Determination of Plutonium in Water: Single-Laboratory Evaluation and Interlaboratory Collaborative Study,
W79-02145 5A

BROWN, R. L.
The Occurrence and Removal of Nitrogen in Subsurface Agricultural Drainage from the San Joaquin Valley, California,
W79-02107 5G

BROWN, S.
Comparative Studies of Cypress Ecosystems,
W79-02277 2H

Distribution of Chlorophyll in Cypress Ecosystems,
W79-02278 2I

BRUHN, H. D.
Increasing Efficiency of Aquatic Plant Management Through Processing,
W79-02158 4A

BUCKLEY, J. L.
Hazardous Material Spills: A Documentation and Analysis of Historical Data,
W79-02411 5G

BUDAKOV, G. A.
Sulfate Turpentine in Unpurified and Purified Effluents from the Baikal Pulp Mill (Sul'fatnyi skipidar v neochishchennykh i ochishchennykh stokakh Baikal'skogo Tsellyuloznogo Zavoda),
W79-02378 5B

BURGES, S. J.
Stochastic Modeling for Predicting Frequency Distribution of Stages in Thermal Lakes at Future Planning Horizons,
W79-02495 4A

BURKHAM, D. E.
Sedimentation in Hot Creek in Vicinity of Hot Creek Fish Hatchery, Mono County, California,
W79-02128 2J

BURMAN, R. D.
Evapotranspiration Estimates for Water Right Transfers,
W79-02491 2D

BURNETT, M. S.
Cypress Growth Response in a Sewage-Enriched Pond Cypress Ecosystem,
W79-02287 5C

BURNS, L. A.
Dissolved Hydrogen Sulfide in Soil Water in San Felasco Hammock and Deerhaven Cypress Dome,
W79-02285 5B

BUSCH, F.
On the Uptake of Three Different Types of Hydrocarbons by Salmon Eggs (Salmo Salar L.),
W79-02464 5C

BUSSCHER, W. J.
Simulated Flow Through the Root Xylem,
W79-02199 2I

CABASSO, I.
Evaluation of Semipermeable Membranes for Concentration or Organic Contaminants in Drinking Water,
W79-02405 5A

CAIRNS, J. E.
Polyquaternary Compounds for the Control of Microbiological Growth,
W79-02331 5D

CAMERON, G. N.
Do Tides Affect Coastal Insect Communities,
W79-02089 2L

CANNELOS, G. J.
Planning for Offshore Oil Development. Gulf of Alaska OCS Handbook,
W79-02198 5G

CANNON, R. E.
The Characterization of Bacillus Capable of Blue-Green Bactericidal Activity,
W79-02159 5D

CANTY, W. T.
Determination of Methylmercury in Fish of South Carolina,
W79-02478 5A

CAPERON, J.
Photosynthetic Rates of Marine Algae as a Function of Inorganic Carbon Concentration,
W79-02224 5C

CARLSON, J. E.
Ecosystem Analyses at Corkscrew Swamp,
W79-02282 2I

CARMONY, N. B.
Drainage Map of Arizona Showing Perennial Streams and Some Important Wetlands,
W79-02121 7C

CAROTHERS, W. W.
Origins of Water and Solutes in the Geopressured Zones of the Northern Gulf of Mexico Basin,
W79-02131 2K

CARPENTER, E. J.
Nutrient and Particulate Fluxes in a Salt Marsh Ecosystem: Tidal Exchanges and Inputs by Precipitation and Groundwater,
W79-02235 5C

CATTANEO, A.
Seasonal Changes in the Epiphyte Community of Natural and Artificial Macrophytes in Lake Memphremagog (QUE. and VT.),
W79-02232 5C

CHAN, K. S.
The Economic Consequences of the 200-Mile Seabed Zone: The Replenishable Resources Case,
W79-02048 6E

CHANG, B. D.
Effects of Burial on the Heart Cockle Clinocardium Nuttallii and the Dungeness Crab Cancer Magister,
W79-02472 5C

CHAPMAN, A. R. O.
Effects of Nitrate Concentration on the Growth and Physiology of Lominaria Saccharina (Phaeophyta) in Culture,
W79-02010 5C

CHATTERJI, M.
Coefficients of Pollution: Interindustry Linkage and Pollution in Belgium,
W79-02031 5G

CHAUHAN, H. S.
Transient Spherical Flow to a Nonpenetrating Well with Constant Drawdown,
W79-02191 4B

CHENG, K.
Dynamic Analysis of Commercial Fishing Model,
W79-02063 6C

CHESNUT, T. L.
Aquatic Vascular Plants of Lake Apopka, Florida,
W79-02420 2I

CHIBA, A.
Effect of Methallibure on the Hypophysis and Gonadal Development of the Cichlid Fish, Tilapia Mossambica,
W79-02477 5C

CHICHESTER, F. W.
Residual Forms of Fertilizer Nitrogen in Field Soils,
W79-02364 2K

CHURILOVA, T. P.
Sulfate Turpentine in Unpurified and Purified Effluents from the Baikal Pulp Mill (Sul'fatnyi skipidar v neochishchennykh i ochishchennykh stokakh Baikal'skogo Tsellyuloznogo Zavoda),
W79-02378 5B

CLARK, M. J.
Handling and Disposal of Sludges from Combined Sewer Overflow Treatment. Phase II - Impact Assessment,
W79-02303 5D

CLARK, V. C.
Planning for Offshore Oil Development. Gulf of Alaska OCS Handbook,
W79-02198 5G

CLAYTON, J. R.
Polychlorinated Biphenyls in Coastal Marine Zooplankton: Bioaccumulation by Equilibrium Partitioning,
W79-02242 5C

CLOERN, J. E.
Simulation Model of Cryptomonas Ovata Population Dynamics in Southern Kootenay Lake, British Columbia,
W79-02225 5C

CLOUGH, G. F. G.
Continuous Treatment of Liquid Effluent and Sewage,
W79-02310 5D

COBB, E. D.
Estimates of 7-Day, 10-Year Minimum Flows at Selected Stream Sites in Puerto Rico,
W79-02125 5B

COBIAN, K. E.
New Membranes for Treating Metal Finishing Effluents by Reverse Osmosis,
W79-02300 5D

COLWELL, R. R.
Effects of Ingesting Mercury-Containing Bacteria on Mercury Tolerance and Growth Rates of Ciliates,
W79-02499 5C

CONEWAY, R. P.
The Downhole TV Camera Can 'See' What's Wrong,
W79-02178 8G

CONEWAY, S.
The Downhole TV Camera Can 'See' What's Wrong,
W79-02178 8G

COOK, J. C.
Optimization and Testing of Highway Materials to Mitigate Ice Adhesion,
W79-02408 8G

COOK, N.
The Distribution and Form of Phosphorus in North Atlantic Ocean Deep-Sea and Continental Slope Sediments,
W79-02230 5B

COOKSEY, B.
Growth-Influencing Substances in Sediment Extracts from a Subtropical Wetland: Investigation Using a Diatom Bioassay,
W79-02476 5C

COOKSEY, K. E.
Growth-Influencing Substances in Sediment Extracts from a Subtropical Wetland: Investigation Using a Diatom Bioassay,
W79-02476 5C

COOPER, W. D.
Separation of an Aqueous or Water-Miscible Liquid from a Fluid Mixture,
W79-02311 5D

COPITHORNE, L. W.
Natural Resources and Regional Disparities: A Skeptical View,
W79-02034 6B

CORDER, T. E.
Water Purifier,
W79-02308 5F

COSBY, B. J.
Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

COSTLE, D. M.
EPA's Construction Grants Program: Perspectives Costs,
W79-02027 5G

COUTTS, H. J.
Research on Control Technology for Ice Fog From Mobile Sources,
W79-02147 5G

COX, J. M.
Surface Drifter Movements Observed in Port Angeles Harbor and Vicinity, April 1978,
W79-02221 2L

COX, W. J.
Ammonium Effects on Nutrient Cation Absorption by Wheat,
W79-02021 3F

CROUSE, M. R.
A Survey of Phosphorus and Nitrogen Levels in Treated Municipal Wastewater,
W79-02003 5A

CROW, J. H.
Earthquake-Initiated Changes in the Nesting Habitat of the Dusky Canada Goose,
W79-02416 2I

CRUSE, H.
Assessment of Hazardous Waste Practices in the Petroleum Refining Industry,
W79-02440 5D

CRUTCHFIELD, J.
Mathematical Models of a Fishery,
W79-02069 6B

CSIKOS-NAGY, B.
The Price of Natural Resources,
W79-02045 6C

CUMBERBATCH, E. R. ST. J.
Sugar Cane Growth in Response to Mulch and Fertilizer on Saline-Alkali Subsoils,
W79-02029 3C

CUMMINGS, R.
Some Extensions of the Economic Theory of Exhaustible Resources,
W79-02064 6B

CYWIN, A.
Advances in Storm and Combined Sewer Pollution Control Abatement Technology,
W79-02437 5D

D'ELIA, C. F.
The Uptake, Retention, and Release of Ammonium by Reef Corals,
W79-02228 5C

DAGAN, G.
A Note on Packer, Slug, and Recovery Tests in Unconfined Aquifers,
W79-02179 8G

DAI, T. S.
Water Level Fluctuation in a Northeastern Ontario Peatland,
W79-02105 2H

DALPKE, H. L.
Status and Methods for Effluent Purification in Pulp and Paper Mills (Stand und Verfahren der Restabwasserreinigung von Zellstoff- und Papierfabriken),
W79-02377 5D

DAVENPORT, D. C.
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

DAVIS, D. E.
Effects of an Organic Arsenical Herbicide on a Salt Marsh Ecosystem,
W79-02427 5C

DAVIS, H.
Progress Repot on Mosquitoe Research: Cypress Domes,
W79-02281 5G

DAVIS, S. N.
Flotation of Fresh Water on Sea Water, A Historical Note,
W79-02171 2F

DAWSON, F. H.
Aquatic Plant Management in Semi-Natural Streams: The Role of Marginal Vegetation,
W79-02012 5G

DE LA CRUZ, A. A.
Amino Acids in Salt Marsh Detritus,
W79-02086 5C

DEAN, J. W.
New Method for Recording Heart and Respiratory Rates in Catfish,
W79-02077 7B

DEGHI, G.
Litterfall and Litter Decomposition in Four Cypress Domes,
W79-02265 2I

DEGHI, G. S.
Growth Rates of Seedlings Planted in Cypress Domes,
W79-02272 5C

Uptake and Distribution of Phosphorus in the Understory of Cypress Domes,
W79-02264 5C

DENCKER, D. O.
Characterization and In-Plant Reduction of Wastewater from Hog Slaughtering Operations,
W79-02298 5D

DENEVERS, N.
Analysis of the Environmental Control Technology for Oil Shale Development,
W79-02432 5G

DERJUGINA, Z.
Investigation of the Microflora of Swamp Ore and Lake Water by the Method of Electron Microscopy, (In German),
W79-02423 5A

DESAI, N. V.
Processing of Pulp and Paper Industry Waste by Reverse Osmosis for Pollution Control,
W79-02373 5D

DESJARDINE, R. L.
Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

DETHLEFSEN, V.
Uptake, Retention and Loss of Cadmium by Brown Shrimp, (Crangon Crangon),
W79-02463 5B

DEUSER, W.
The Nature of Growth Forms in the Salt Marsh Grass Spartina Alterniflora,
W79-02087 2L

DIERBERG, F. E.
Water Quality of Cypress Domes: Routine Sampling Program,
W79-02269 5C

DIERBORG, F. E.
Denitrification and Surface Runoff in the Experimental Domes: Cypress Wetlands,
W79-02270 5C

DIETRICH, K. T.
Profile and Measurement of Social Well-Being Indicators for Use in the Evaluation of Water and Related Land Management Planning,
W79-02344 6B

DIGIANO, F. A.
Wind Induced Dispersion and Algal Growth in Shallow Lakes,
W79-02226 5G

DILLON, P. J.
An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships of Lakes,
W79-02247 5C

DINCER, T.
An Evaluation of Isotope Concentrations in the Ground Water of Saudi Arabia,
W79-02254 2F

DODD, D. J. R.
Nitrate Reduction by Denitrifying Bacteria in Single and Two Stage Continuous Flow Reactors,
W79-02406 5D

DODGE, D. P.
Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

DOLAN, R.
Structural Control of the Rapids and Pools of the Colorado River in the Grand Canyon,
W79-02200 2E

DOMINGUEZ, S. E.
A Survey of Phosphorus and Nitrogen Levels in Treated Municipal Wastewater,
W79-02003 5A

DONER, H. E.
Disappearance of Nitrate Under Transient Conditions in Columns of Soil,
W79-02122 2G

DONIGIAN, A. S. JR.
Planning and Modeling in Urban Water Management,
W79-02288 6B

DORMAN, G. K.
New Method for Recording Heart and Respiratory Rates in Catfish,
W79-02077 7B

DRECHSLER, H. D.
The Effects of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-02498 5G

DRESCHER, H. E.
Further Data on Heavy Metals and Organochlorines in Marine Mammals from German Coastal Waters,
W79-02460 5B

DROZDOV, N. P.
Chemical Foam Control During Effluent Treatment in Aeration Tanks (Khimicheskoe penogashenie pri ochistke stochnykh vod v aerotenkakh),
W79-02382 5D

Purification of Effluents of the Verkhotursk Wood Chemical Plant in Storage Ponds (Ochistka stochnykh vod Verkhoturskogo Lesokhimicheskogo Zavoda v prudu-nakopitele),
W79-02372 5D

DUBININA, V. G.
Investigation of the Microflora of Swamp Ore and Lake Water by the Method of Electron Microscopy, (In German),
W79-02423 5A

DUDZIK, M.
Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

DUEVER, L. C.
Ecosystem Analyses at Corkscrew Swamp,
W79-02282 2I

DUEVER, M.
Forested Wetlands of Florida-Their Management and Use,
W79-02112 6B

DUEVER, M. J.
Ecosystem Analyses at Corkscrew Swamp,
W79-02282 2I

DUSEJA, D. R.
Field Persistence and Movement of Trifluralin in Two Soil Types,
W79-02417 2G

EASTON, J. D.
Physiological Aspects of Water Use Efficiency,
W79-02449 2I

EAVIS, B. W.
Sugar Cane Growth in Response to Mulch and Fertilizer on Saline-Alkali Subsoils,
W79-02029 3C

EBBESMEYER, C. C.
Surface Drifter Movements Observed in Port Angeles Harbor and Vicinity, April 1978,
W79-02221 2L

ECKHOFF, D.
Analysis of the Environmental Control Technology for Oil Shale Development,
W79-02432 5G

EDWARDS, A. C.
Effects of an Organic Arsenical Herbicide on a Salt Marsh Ecosystem,
W79-02427 5C

EDWARDS, M. D.
Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W79-02123 10D

ELEUTERIUS, L. N.
The Distribution of Juncus Roemerianus in the Salt Marshes of North America,
W79-02093 2L

ENAMI, M.
Apparatus for Collecting Effluent Oil,
W79-02339 5G

ENGEL, P.
Hydraulic Model Tests of the Proposed Weir for the Richelieu River at St. Jean, Quebec,
W79-02414 8C

ENGLER, R. M.
Effect of Dissolved Oxygen and Redox Potential and Nitrate Removal in Flooded Swamp and Marsh Soils,
W79-02426 5C

EVANS, R. L.
Preliminary Evaluation of Final Cut Lakes,
W79-02292 5G

EWEL, K.
Forested Wetlands of Florida-Their Management and Use,
W79-02112 6B

EWEL, K. C.
Changes in Understory Vegetation in Cypress Domes Brought About by Fire and Addition of Sewage,
W79-02263 5C

Cypress Wetlands for Water Management, Recycling and Conservation (Third Annual Report, November 1, 1975 to December 15, 1976),
W79-02256 2I

Seasonal Changes in the Distribution of Water Fern and Duckweed in Cypress Domes Receiving Sewage,
W79-02262 2I

EYER, C. S.
Evaluation of Semipermeable Membranes for Concentration or Organic Contaminants in Drinking Water,
W79-02405 5A

FAN, L. T.
Optimal Configuration of the Cooling System for Power Generation,
W79-02081 5G

FARAG, M. H.
Fossil Ground-Water Gradients in Arid Regional Sedimentary Basins,
W79-02189 2F

FARMER, L. D.
Physical Properties of Icebergs, Part I--Height to Draft Ratios of Icebergs, Part II--Mass Estimation of Arctic Icebergs,
W79-02216 2C

FARNHAM, R. S.
Minnesota's Peat Resources: Their Characteristics and Use in Sewage Treatment, Agriculture, and Energy,
W79-02255 5G

FEDERER, C. A.
Brook: A Hydrologic Simulation Model for Eastern Forests,
W79-02448 4D

FERGUSON, T. L.
Wastewater Treatment Technology Documentation for DDT Manufacture,
W79-02444 5D

Wastewater Treatment Technology Documentation for Toxaphene Manufacture,
W79-02439 5D

FFOLLIOTT, P. F.
Water Quality of Streamflow from Forested Watersheds on Sedimentary Soils,
W79-02404 5B

FIELD, B. C.
Implications of Alternative Measures of Natural Resource Scarcity,
W79-02049 6B

FIERY, F. C.
Investigations of Heat Treatment for Paper Mill Sludge Conditioning,
W79-02296 5E

FINAN, M. A.
Novel Compositions of Matter for Use in the Treatment of Aqueous Systems,
W79-02335 5F

FINSTEIN, M. S.
Significance of Nitrification in Stream Analysis-Effects on the Oxygen Balance,
W79-02001 5C

FIRESTONE, B. M.
An Analysis of Network Costs: A Study of Sydney's Water Supply from 1890 to 2001, Part I: Research Methods,
W79-02033 6B

FLECKSEDER, H.
Pulp Industry and Water Pollution Control (Zellstoffindustrie und Gewaesserschutz),
W79-02370 5G

FLEMING, D. M.
Food Habits of Coastal Marsh Raccoons with Observations of Alligator Nest Predation,
W79-02117 2L

FLETCHER, D. J.
New Method for Recording Heart and Respiratory Rates in Catfish,
W79-02077 7B

P-32 Uptake in Lentic Algae,
W79-02078 5C

FOKIN, P. S.
Chemical Foam Control During Effluent Treatment in Aeration Tanks (Khimicheskoe penogashenie pri ochistke stochnykh vod v aerotenkakh),
W79-02382 5D

FOLEY, D. D.
The Productivity of Lake Champlain wit Regard to Waterfowl, Furbearers, and Other Wildlife,
W79-02114 2H

FORD, D. C.
The Origin of Labyrinth and Tower Karst and the Climatic Conditions Necessary for Their Development,
W79-02073 2F

FORD, R. S.
Ground Water...California's Priceless Resource.
W79-02392 4B

FORTMANN, L. C.
Ethylmercury: Formation in Plant Tissues and Relation to Methylmercury Formation,
W79-02488 5A

FOSTER, J. E.
Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation,
W79-02354 8B

FOWLER, J.
Perimeter Dike Raising with Dewatered Fine-Grained Dredged Material at Upper Polecat Bay Disposal Area, Mobile, Alabama,
W79-02345 5E

FOX, J.
Coliform Monitoring of Waters Associated with the Cypress Dome Project,
W79-02268 5C

FOX, J. L.
The Response of Benthic Invertebrate Populations to Sewage Addition,
W79-02267 5C

FRANCO, J. J.
Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation,
W79-02354 8B

FRANK, A. B.
Growth and Yield of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02035 3F

Plant Water Relationships of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02043 3F

FRANK, R.
Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

FRANKLIN, C. S.
The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

FRIIS, M.
Examination of a Lake Model,
W79-02007 5C

FRITTON, D. D.
Simulated Flow Through the Root Xylem,
W79-02199 2I

FROELICH, P. N.
Systematic Absorbance Errors with Technicon AutoAnalyzer II Colorimeters,
W79-02074 2K

FUEHRING, H. D.
Yield of Dryland Grain Sorghum as Affected by Antitranspirant, Nitrogen, and Contributing Micro-Watershed,
W79-02403 3F

FUKUDA, S.
Apparatus for Collecting Effluent Oil,
W79-02339 5G

GACHTER, R.
A Dynamic Lake Model for Trophic State Prediction,
W79-02006 5C

GADD, G. M.
Microorganisms and Heavy metal Toxicity,
W79-02483 5C

GAIRON, S.
Electrical Potentials During Water Entry into an Air-Dry Mixture of Sand and Kaolinite,
W79-02357 2G

Streaming-Potential Effects in Saturated Water Flow Through a Sand-Kaolinite Mixture,
W79-02160 2G

GAJDOS, J.
Possibility of Rendering Bleachery Effluents Harmless by Technological Changes (Ueber die Moeglichkeit Bleichereiabwaesser durch technologische Aenderungen unschaedlich zu machen),
W79-02360 5G

GAKSTATTER, J. H.
A Survey of Phosphorus and Nitrogen Levels in Treated Municipal Wastewater,
W79-02003 5A

GALLEGOS, C.
Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

GAMBLE, W. L.
Strength and Behavior of Thick Waled Reinforced Concrete Conduits,
W79-02217 8F

GANIN, G. I.
Conversion of Lignosulfonates in Natural Waters (Prevrashchenie lignosul'fonatov v prirodnykh vodakh),
W79-02379 5B

GARY, H. L.
Range Cattle Impacts on Stream Water Quality in the Colorado Front Range,
W79-02386 5G

GASS, T. E.
Surface Water VS. Ground Water,
W79-02176 4B

GAY, D. D.
Ethylmercury: Formation in Plant Tissues and Relation to Methylmercury Formation,
W79-02488 5A

GAY, L. W.
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

GEIKE, F.
Effect of Hexachlorobenzene (HCB) on Photosynthetic Oxygen Evolution and Respiration of Chlorella Pyrenoidosa,
W79-02480 5C

GEINOPOLOS, A.
Handling and Disposal of Sludges from Combined Sewer Overflow Treatment. Phase II - Impact Assessment,
W79-02303 5D

GELLER, A.
Fish Test With Golden Orfe -- Testing the Toxicity of Matter Contained in Water (Fischtest mit Goldorfen -- Pruefung der Toxizitaet von Wasserinhaltsstoffen),
W79-02375 5C

GEORGE, C. J.
Improved Techniques for Evaluating Carbonate Waterfloods in West Texas,
W79-02182 4B

GHANEM, H. M. F.
Design and Proof Test Requirements for Precast Reinforced Concrete Box Culverts,
W79-02218 8F

GIBB, J. P.
Preliminary Evaluation of Final Cut Lakes,
W79-02292 5G

GILLESPIE, D.
Hydrology of the Austin Cary Control Dome,
W79-02260 5E

GILLESPIE, D. P.
Stratigraphy and Hydrogeologic Correlation Studies in Several Cypress Domes-North Central Florida,
W79-02259 5E

GLANTZ, M. H.
Nine Fallacies of Natural Disaster: The Case of the Sahel,
W79-02398 6B

GLEASON, P. J.
The Organic Sediments of Corkscrew Swamp Sanctuary,
W79-02284 2H

GLENNE, B.
Analysis of the Environmental Control Technology for Oil Shale Development,
W79-02432 5G

GLOSBY, A. A.
Anion Exchange Method for the Determination of Plutonium in Water: Single-Laboratory Evaluation and Interlaboratory Collaborative Study,
W79-02145 5A

GOERING, J. J.
Ammonium Oxidation and its Significance in the Summer Cycling of Nitrogen in Oxygen Depleted Skan Bay, Unalaska Islanda, Alaska,
W79-02004 5C

GOODE, J. V. JR.
Device for Measuring pH and Temperature of a Liquid, Which Includes a Memory,
W79-02316 5A

GORDON, R. B.
Transportation and Accumulation of Fine-Grained Sediments in the Estuarine Environment: Recommendations for Research,
W79-02165 2L

GORSLINE, D. S.
Hypersaline Lagoonal Deposits and Processes,
W79-02430 2L

GOTTSCHING, L.
Fish Test With Golden Orfe -- Testing the Toxicity of Matter Contained in Water (Fischtest mit Goldorfen -- Pruefung der Toxizitaet von Wasserinhaltsstoffen),
W79-02375 5C

GRAESER, H. J.
Financing System Changes,
W79-02023 6C

GRAETZ, D. A.
Nitrogen Transformations in Water and Sediments of Cypress Domes with and without Added Sewage Effluent,
W79-02276 2H

Sedimentation Rates: Cypress Domes,
W79-02275 5C

GREGORY, P. W.
Water Quality of Streamflow from Forested Watersheds on Sedimentary Soils,
W79-02404 5B

GRIFFITHS, A. J.
Microorganisms and Heavy metal Toxicity,
W79-02483 5C

GRIFFITHS, M.
Specific Blue-Green Algal Carotenoids in Sediments of Esthwaite Water,
W79-02246 5C

GROSS, C. M.
Dredge Spoil in Mississippi Sound,
W79-02188 5E

GROTHMAN, D. L.
Characterization and In-Plant Reduction of Wastewater from Hog Slaughtering Operations,
W79-02298 5D

GRUBB, H. F.
Potential for Downward Leakage to the Floridan Aquifer, Green Swamp Area, Central Florida,
W79-02136 7C

GUNDERSON, L.
Accelerating Secondary Succession in Cypress Strands,
W79-02283 2I

GUNDERSON, L. H.
Ecosystem Analyses at Corkscrew Swamp,
W79-02282 2I

GUNDLACH, E. R.
The Urquiola Oil Spill, La Coruna, Spain: Impact and Reaction on Beaches and Rocky Coasts,
W79-02500 5C

GUR, Y.
Application of the Electrical Double Layer Theory to Predict Ion Absorption in Mixed Ionic Systems,
W79-02314 2K

GURBANOV, S. G.
Computation of the Concentration of Substances in Rivers and Canals,
W79-02206 5B

GUSEMAN, P. K.
Profile and Measurement of Social Well-Being Indicators for Use in the Evaluation of Water and Related Land Management Planning,
W79-02344 6B

HAAVISTO, V. F.
Water Level Fluctuation in a Northeastern Ontario Peatland,
W79-02105 2H

HAGAN, R. M.
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

HAGIN, J.
A Computer Simulation of Phosphate and Nitrogen Transport by Water Runoff,
W79-02251 5B

HALIBURTON, T. A.
Perimeter Dike Raising with Dewatered Fine-Grained Dredged Material at Upper Polecat Bay Disposal Area, Mobile, Alabama,
W79-02345 5E

HALL, W. B.
Bark as a Medium for Gravity Dewatering of Secondary Sludge from Pulp and Paper Mills,
W79-02186 5D

HALVERSON, H. G.
Precipitation and Runoff Water Quality from an Urban Parking Lot and Implications for Tree Growth,
W79-02387 5B

HAMILTON, L. J.
Major Aquifers in Clark County, South Dakota,
W79-02134 2F

HAMMETT, K. M.
Magnitude and Frequency of Flooding on the Myakka River, Southwest Florida,
W79-02129 4A

HANNESSON, R.
A Note on the Welfare-Economic Consequences of Extended Fishing Limits,
W79-02047 6E

HANSEN, D. E.
Water Utilization and Reallocation in Chile: A Study of the Pirque Valley,
W79-02053 6B

HANSON, C. E.
Water Quality in the Old Plantation Water Control District, Broward County, Florida-Progress Report, July 1976-June 1977,
W79-02127 5B

HARDT, W. F.
Model Aids Planners in Predicting Rising Ground-Water Levels in San Bernadino, California,
W79-02173 4B

HARMS, U.
Further Data on Heavy Metals and Organochlorines in Marine Mammals from German Coastal Waters,
W79-02460 5B

HARRIS, D. G.
Growth and Yield of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02035 3F

Plant Water Relationships of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02043 3F

HARRIS, L. D.
The Effects of Perturbation on Cypress Dome Animal Communities,
W79-02279 5C

HARRIS, R. F.
Kinetics of Algal Transient Phosphate Uptake and the Cell Quota Concept,
W79-02237 5C

Kinetics of Phosphate Uptake by Aquatic Microorganisms: Deviations from a Simple Michaelis-Menten Equation,
W79-02016 5C

HATTORI, A.
Ammonium Oxidation and its Significance in the Summer Cycling of Nitrogen in Oxygen Depleted Skan Bay, Unalaska Islanda, Alaska,
W79-02004 5C

HAUEISEN, A. J.
An Examination of Legislation for the Protection of the Wetlands of the Atlantic and Gulf Coast States,
W79-02106 6E

HAYES, M. O.
The Urquiola Oil Spill, La Coruna, Spain: Impact and Reaction on Beaches and Rocky Coasts,
W79-02500 5C

HEAL, G.
The Long-Run Movement of the Prices of Exhaustible Resources,
W79-02026 6C

HEIMBURG, K.
Hydrologic Budget Model,
W79-02258 2H

Hydrology and Water Budgets of Cypress Domes,
W79-02257 5B

Radiation Studies: Cypress Wetlands,
W79-02261 2I

HEISLER, G. M.
Precipitation and Runoff Water Quality from an Urban Parking Lot and Implications for Tree Growth,
W79-02387 5B

HELSETH, J. M.
Surface Drifter Movements Observed in Port Angeles Harbor and Vicinity, April 1978,
W79-02221 2L

HENDRICKS, D. L.
Effects of Ingesting Mercury-Containing Bacteria on Mercury Tolerance and Growth Rates of Ciliates,
W79-02499 5C

HENNEBERRY, B.
The Limited Applicability of Marshallian Economics to the Problem of Pollution Abatement: A Suggested Alternative,
W79-02041 5G

HENNING, R. J.
The Need for Professionalism and its Attributes in Hydrogeology,
W79-02174 6E

HENRIKSON, S. A.
Process for the Preparation of a Substantially Homogeneous Lime Water solution,
W79-02323 5D

HENSON, B. L.
Ion Mobilities in Pure Water Vapour at Saturation,
W79-02076 1B

HERDENDORF, C. E.
Environmental Impact Assessment: An Aquatic Biologist's Point of View,
W79-02222 6G

HERN, S. C.
Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

HICKEY, W. D.
The Idaho and Montana Procedures for Obtaining Water Use Permits--Possible Sources for Improvement of Wyoming Law, Comments,
W79-02082 6E

HIKITE, A.
Blood Corpuscle Resistance of Carp Died of Environmental Hypoxia and of Cyanide Poisoning, (In Japanese),
W79-02471 5C

HILL, R. D.
Acid Mine Drainage and Subsidence: Effects of Increased Coal Utilization,
W79-02409 5G

HIRAI, M.
Desalination in the Reuse of Industrial Waste Water,
W79-02383 5D

HIRSCHFELD, Y.
A Hydraulic Installation in the Water Supply System of Emmaus-Nicopolis,
W79-02394 4A

HOLMES, E. E.
Field Persistence and Movement of Trifluralin in Two Soil Types,
W79-02417 2G

HONMA, Y.
Effect of Methallibure on the Hypophysis and Gonadal Development of the Cichlid Fish, Tilapia Mossambica,
W79-02477 5C

HORNBERGER, G. M.
Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

HORNE, A. J.
A Pattern Analysis of Clear Lake Phytoplankton,
W79-02227 5C

HORNIG, C. E.
Macroinvertebrate Sampling Techniques For Streams in Semi-Arid Regions: Comparison of the Surber Method and A Unit-Effort Traveling Kick Method,
W79-02146 5A

HOVANESIAN, J. C.
Dredge Spoil in Mississippi Sound,
W79-02188 5E

HOWAD, A.
Structural Control of the Rapids and Pools of the Colorado River in the Grand Canyon,
W79-02200 2E

HSU, H. Y.
Treatment Effectiveness for the Removal of Selected Contaminants from Drinking Water,
W79-02435 5F

HUGHES, T. C.
Management of Rural Water Supply Peak Flow Rates,
W79-02194 3D

HUIBREGTSE, K. R.
Handling and Disposal of Sludges from Combined Sewer Overflow Treatment. Phase II - Impact Assessment,
W79-02303 5D

HUMPHREYS, A.
Controlling Sediment in Surface Runoff,
W79-02097 3F

HUNTOON, P. W.
Holocene Faulting in the Western Grand Canyon, Arizona,
W79-02496 2J

HUSCHENBETH, E.
Further Data on Heavy Metals and Organochlorines in Marine Mammals from German Coastal Waters,
W79-02460 5B

HUTCHINSON, C. B.
Model Aids Planners in Predicting Rising Ground-Water Levels in San Bernadino, California,
W79-02173 4B

HWANG, C. L.
Optimal Configuration of the Cooling System for Power Generation,
W79-02081 5G

HYNES, H. B. N.
Particulate and Dissolved Organic Matter in a Small Partly Forested Ontario Stream,
W79-02252 5C

The Uptake of Dissolved Organic Matter by a Small Spring Stream,
W79-02248 5C

IBAD-ZADE, YU. A.
Computation of the Concentration of Substances in Rivers and Canals,
W79-02206 5B

IIZUKA, M.
Apparatus for Collecting Effluent Oil,
W79-02339 5G

IKAN, R.
Hula Valley Peat: Review of Chemical and Geochemical Aspects,
W79-02365 2K

IMBODEN, D. M.
A Dynamic Lake Model for Trophic State Prediction,
W79-02006 5C

INYANG, N. M.
Effects of Some Environmental Factors on Growth and Food Consumption of the Baltic Palaemonid Shrimp, Palaemon Adspersus Var. Fabricii (Rathke),
W79-02465 5C

IVANOV, V. P.
Study of River Meandering in the Search for Tectonic Structures (As Exemplified by the Middle Dniester Region),
W79-02205 8E

JAISWAL, C. S.
Transient Spherical Flow to a Nonpenetrating Well with Constant Drawdown,
W79-02191 4B

JAMES, L. D.
Stochastic Modeling for Predicting Frequency Distribution of Stages in Thermal Lakes at Future Planning Horizons,
W79-02495 4A

JANOULIS, A. J.
Apparatus for Collecting Debris Floating in a Stream,
W79-02328 5G

JASSBY, A.
Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

JAY, J.
Filration System,
W79-02332 5D

JEFFREY, D. W.
Intertidal Environment of Northern Dublin Bay,
W79-02204 5B

JENNINGS, M. E.
Comparison of the Predictive Accuracy of Models of Urban Flow and Water-Quality Processes,
W79-02253 5B

JETTER, W.
The Effects of Perturbation on Cypress Dome Animal Communities,
W79-02279 5C

JOANEN, T.
Alligator Diets in Relation to Marsh Salinity,
W79-02118 2L

Effects of Simulated Flooding on Alligator Eggs,
W79-02116 2L

Food Habits of Coastal Marsh Raccoons with Observations of Alligator Nest Predation,
W79-02117 2L

JOHNSON, J. H.
Aquatic Disposal Field Investigations Duwamish Waterway Disposal Site Puget Sound, Washington, Evaluative Summary,
W79-02350 5C

JOHNSON, S. R.
Range Cattle Impacts on Stream Water Quality in the Colorado Front Range,
W79-02386 5G

JOHNSTON, M. K.
Cypress Wetlands for Water Management, Recycling and Conservation (Third Annual Report, November 1, 1975 to December 15, 1976),
W79-02256 2I

JONES, B. A.
The Effects of Storm Events on the Annual Phosphorus Transport in Six-Mile Run,
W79-02153 5B

JONES, C. R.
Distribution of Surficial Sediments and Eelgrass in New York's South Shore Bays: An Assessment from the Literature,
W79-02162 2L

JONES, D. R. IV
Atomic Absorption Detector for Chromium Organometallic Compounds Separated by High Speed Liquid Chromatography,
W79-02080 5A

Measurement of Chelating Agent Levels in Media with High Concentrations of Interfering Metal Ions,
W79-02079 5A

JONES, J. B.
Differential Effect of Bermuda and Bahiagrasses on Soil Chemical Characteristics,
W79-02381 3F

JONES, N. V.
The Effects of Weed-Cutting on the Macro-Inverterate Fauna of a Canalised Section of the River Hull, A Northern English Chalk Stream,
W79-02002 5C

JORGENSEN, S. E.
Examination of a Lake Model,
W79-02007 5C

JURY, W. A.
Advection Modification of the Priestley and Taylor Evapotranspiration Formula,
W79-02395 2D

KALBASI, M.
Mechanism of Zinc Adsorption by Iron and Aluminum Oxides,
W79-02359 2K

Reaction Products and Solubility of Applied Zinc Compounds in Some Manitoba Soils,
W79-02362 2K

KALFF, J.
Seasonal Changes in the Epiphyte Community of Natural and Artificial Macrophytes in Lake Memphremagog (QUE. and VT.),
W79-02232 5C

KALTER, R. J.
A Simulation Model for Resource Policy Evaluation,
W79-02025 6A

KAMBUROV, J.
Transpiration Effects on Leaching Fractions,
W79-02019 3C

KAMDAR, R. S.
Adsorption of Poliovirus Type I to Wastewater Treatment Plant Solids,
W79-02446 5D

KAMYKOWSKI, D.
Organism Patchiness in Lakes Resulting from the Interaction Between the Internal Seiche and Planktonic Diurnal Vertical Migration,
W79-02009 5C

KANEDA, H.
Desalination in the Reuse of Industrial Waste Water,
W79-02383 5D

KANEMASU, E. T.
The Micro-Climate of Narrow- and Wide-Row Sorghum With Equal Plant Densities,
W79-02358 2D

KANNO, H.
Supercooling of Water to -92 Degrees C Under Pressure,
W79-02494 2C

KAPLIN, V. T.
Conversion of Lignosulfonates in Natural Waters (Prevrashchenie lignosul'fonatov v prirodnykh vodakh),
W79-02379 5B

KASAI, H.
Apparatus for Collecting Effluent Oil,
W79-02339 5G

KATZER, J. R.
Involvement of Free Radicals in the Aqueous-Phase Catalytic Oxidation of Phenol Over Copper Oxide,
W79-02166 5D

KAUFMAN, R. I.
Control of 1973 Mississippi River Flood,
W79-02195 4A

KAUL, J. L.
A Non-Linear Programming Approach to Floodplain Management with Non-Structural Alternatives,
W79-02400 6F

KEINATH, T. M.
Benzidine: Wastewater Treatment Technology,
W79-02445 5D

KELLY, M. G.
Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

KELSO, G. L.
Wastewater Treatment Technology Documentation for DDT Manufacture,
W79-02444 5D

Wastewater Treatment Technology Documentation for Toxaphene Manufacture,
W79-02439 5D

KENNISH, M. J.
Effects of Thermal Discharges on Mortality of Mercenaria Mercenaria in Barnegat Bay, New Jersey,
W79-02473 5C

KEPPELMULLER, P.
Possibilities for Reducing COD and 5-Day BOD in Waste Waters from the Pulp and Viscose Rayon Fiber Industries (Moeglichkeiten zur Reduktion des CSB und BSB(5) in den Abwaessern der Zellstoff- und Viskosefaserindustrie),
W79-02376 5D

KERFOOT, W. B.
Scanning Apparatus for Septic Effluents,
W79-02340 5D

KERR, G. L.
Lawn Sprinkler Distribution Patterns,
W79-02155 3F

KERSHAW, M. A.
Overseas Markets for the Water Industry - Nigeria,
W79-02030 5G

KHANNA, P. K.
The Behavio of Sulfate on Salt Input in Podzolic Brown Earth,
W79-02321 2K

KHARAKA, Y. K.
Origins of Water and Solutes in the Geopressured Zones of the Northern Gulf of Mexico Basin,
W79-02131 2K

KHARIN, N. G.
Remote Sensing Techniques and the Monitoring of Desertification Processes in Arid Areas,
W79-02390 7B

KILINGER, M.
Treatment Effectiveness for the Removal of Selected Contaminants from Drinking Water,
W79-02435 5F

KING, J. M.
The Controversy Continues: State Ownership of Drill Rigs,
W79-02168 6E

KING, P.
Procedure for the Evaluation of Environmental Monitoring Laboratories,
W79-02149 5A

KIRSCH, L. M.
Diurnal Use of Small Wetlands by Ducks,
W79-02418 2I

KIRSCHMAN, F. C.
Home Water Distiller,
W79-02319 5F

KISSEL, D. E.
Residual Forms of Fertilizer Nitrogen in Field Soils,
W79-02364 2K

KJERFVE, B.
Velocity Averaging in Estuaries Characterized by a Large Tidal Range to Depth Ratio,
W79-02355 2L

KLEIBS, K.
Influence of Silver Carp (Hypophtalmichthys Molitrix) on Plankton of Shallow Waters According to Investigations in Carp Ponds (Wirkungen Von Silberkarpfen (Hypophthalmichtmys Molitrix) Auf Das Plankton in Flachcewassern Nach Untersuchungen in Karpfenteichen),
W79-02457 5C

KLEIN, E.
Evaluation of Semipermeable Membranes for Concentration or Organic Contaminants in Drinking Water,
W79-02405 5A

KLETT, A. T.
Diurnal Use of Small Wetlands by Ducks,
W79-02418 2I

KLUGMAN, M. P.
Drought in the Upper Midwest, 1931-1969,
W79-02196 2B

KNUPPEL, L. A.
Liquefaction Potential of Hydraulic Fills,
W79-02203 8D

KOCHANOWSKI, P.
The Limited Applicability of Marshallian Economics to the Problem of Pollution Abatement: A Suggested Alternative,
W79-02041 5G

KOEGEL, R. G.
Increasing Efficiency of Aquatic Plant Management Through Processing,
W79-02158 4A

KOGIKU, K. C.
Coordinating Public Utility Expansion, Industrial Siting and Pollution Control: A Working Dynamic Programming Algorithm,
W79-02039 5G

KOLI, A. K.
Determination of Methylmercury in Fish of South Carolina,
W79-02478 5A

KOONCE, J. F.
Kinetics of Phosphate Uptake by Aquatic Microorganisms: Deviations from a Simple Michaelis-Menten Equation,
W79-02016 5C

KORHONEN, J.
Analyses of Paper Machine Waters with Ion Specific Electrodes. Part V. Sulfide Determination Using Ag(+) Ion Specific Electrode and Various Measurement Methods,
W79-02388 5A

KOSTRINSKY, M.
Wind, Sprinkler Patterns, and System Design,
W79-02368 3F

KOTILA, P. M.
Effect of Antimycin on Stream Insects in Field and Laboratory Trials,
W79-02156 5C

KRAMER, L. S.
Planning for Offshore Oil Development. Gulf of Alaska OCS Handbook,
W79-02198 5G

KRIEG, M.
Process for Reducing the Mercury Content of Industrial Waste Waters,
W79-02313 5D

KRIUL'KOV, V. A.
Conversion of Lignosulfonates in Natural Waters (Prevrashchenie lignosul'fonatov v prirodnykh vodakh),
W79-02379 5B

KRIVAK, J. A.
Best Management Practices to Control Nonpoint-Source Pollution from Agriculture,
W79-02233 5G

KROFCHAK, D.
Method of Treating a Waste Liquid Containing Polluting Compounds,
W79-02324 5D

KRUH, G.
A Computer Simulation of Phosphate and Nitrogen Transport by Water Runoff,
W79-02251 5B

KRUKAR, M.
Optimization and Testing of Highway Materials to Mitigate Ice Adhesion,
W79-02408 8G

KUDRYAVTSEV, G. S.
Chemical Foam Control During Effluent Treatment in Aeration Tanks (Khimicheskoe penogashenie pri ochistke stochnykh vod v aerotenkakh),
W79-02382 5D

KUHNHOLD, W. W.
On the Uptake of Three Different Types of Hydrocarbons by Salmon Eggs (Salmo Salar L.),
W79-02464 5C

KUNISADA, Y.
Desalination in the Reuse of Industrial Waste Water,
W79-02383 5D

KUPTSOVA, Z. K.
Purification of Effluents of the Verkhotursk Wood Chemical Plant in Storage Ponds (Ochistka stochnykh vod Verkhoturskogo Lesokhimicheskogo Zavoda v prudu-nakopitele),
W79-02372 5D

KUZ'MIN, A. A.
Instruments for Monitoring the Quality of Natural and Waste Waters,
W79-02214 5A

KVESETH, N. J.
Organchlorines in Codfish from Harbours Along the Norwegian Coast,
W79-02479 5C

KYNARD, B. E.
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

L'VOVICH, M. I.
Geographic Aspects of the Territorial Redistribution of Water Resources,
W79-02209 4A

LACKEY, R. T.
Computer Assisted Instruction in Natural Resource Management,
W79-02161 7C

LAJEUNESS, J. B.
Waste Water Reclamation Apparatus,
W79-02341 5D

LAKE, J. L.
The Effects of Petroleum on the Salt Marsh Ecosystem,
W79-02485 5C

LAMBOU, V. W.
Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

LAMPERT, W.
Release of Dissolved Organic Carbon by Grazing Zooplankton,
W79-02234 5C

LANDINE, R. C.
Economic Evaluation of Four Sludge Dewatering Devices,
W79-02037 5D

LANDWEHR, J. M.
Some Comparisons of Flood Statistics in Real and Log Space,
W79-02119 2E

LANGAN, J. P.
Perimeter Dike Raising with Dewatered Fine-Grained Dredged Material at Upper Polecat Bay Disposal Area, Mobile, Alabama,
W79-02345 5E

LANNERGREN, C.
Net-And Nanoplankton: Effects of an Oil Spill in the North Sea,
W79-02467 5C

LANZING, W. J. R.
Effect of Methallibure on the Hypophysis and Gonadal Development of the Cichlid Fish, Tilapia Mossambica,
W79-02477 5C

LAPAN, E.
Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

LARKIN, D. G.
The Economics of Water Conservation,
W79-02022 3D

LARSON, J. D.
Chemical Quality of Ground Water in Fairfax County, Virginia,
W79-02133 7C

LARSON, J. S.
Evaluation Models for Public Management of Freshwater Wetlands,
W79-02401 6B

Identification and Delineation of Freshwater Wetland Values,
W79-02402 6B

LASH, D.
Brook: A Hydrologic Simulation Model for Eastern Forests,
W79-02448 4D

LASSEN, H.
A Method of Predicting the Biological Effects of Synthetic Pollutants in the North Sea,
W79-02470 5C

LAU, Y. L.
Hydraulic Model Tests of the Proposed Weir for the Richelieu River at St. Jean, Quebec,
W79-02414 8C

LE BOURHIS, M.
Toxicity, BOD, and Color of Effluents from Novel Bleaching Processes,
W79-02374 5C

LEE, K. L.
Liquefaction Potential of Hydraulic Fills,
W79-02203 8D

LEE, P. P. F.
Investigation of Matrix Interferences for AAS Trace Metal Analyses of Sediments,
W79-02143 5A

LEVENDUSKY, J. A.
Method of and Apparatus for Purifying Fluids with Radioactive Impurities,
W79-02307 5D

LEVINE, G.
Issues in Water Development Decisions: A Discussion Paper,
W79-02042 6B

LEVINGS, C. D.
Effects of Burial on the Heart Cockle Clinocardium Nuttallii and the Dungeness Crab Cancer Magister,
W79-02472 5C

LEVY, D.
Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

LEWEN-RUDGERS, L. A.
Reaction Products and Solubility of Applied Zinc Compounds in Some Manitoba Soils,
W79-02362 2K

LEWIN, J.
Blooms of Surf-Zone Diatoms Along the Coast of the Olympic Peninsula, Washington, IX. Factors Controlling the Seasonal Cycle of Nitrate in the Surf at Copalis Beach (1971 through 1975),
W79-02244 5C

LIGHTNER, D. V.
Possible Toxic Effects of the Marine Blue-Green Alga, Spirulina Subsalsa, on the Blue Shrimp, Penaeus Stylirostris,
W79-02459 5C

LIGHTSEY, G. R.
Bark as a Medium for Gravity Dewatering of Secondary Sludge from Pulp and Paper Mills,
W79-02186 5D

LIJKLEMA, L.
Wind Induced Dispersion and Algal Growth in Shallow Lakes,
W79-02226 5G

LIN, S. H.
Optimal Configuration of the Cooling System for Power Generation,
W79-02081 5G

LINERO, A. A.
Air Emissions from Cypress Swamps,
W79-02266 5C

LINSLEY, R. K.
Planning and Modeling in Urban Water Management,
W79-02288 6B

LINSTEDT, K.
Pollutional Characteristics of Stormwater Runoff,
W79-02451 5B

LIVERMORE, D. F.
Increasing Efficiency of Aquatic Plant Management Through Processing,
W79-02158 4A

LLOYD, J. P.
Design and Proof Test Requirements for Precast Reinforced Concrete Box Culverts,
W79-02218 8F

LLOYD, J. W.
Fossil Ground-Water Gradients in Arid Regional Sedimentary Basins,
W79-02189 2F

LOEWEN-RUDGERS, L. A.
Mechanism of Zinc Adsorption by Iron and Aluminum Oxides,
W79-02359 2K

LOFY, R. J.
Assessment of Hazardous Waste Practices in the Petroleum Refining Industry,
W79-02440 5D

LONG, R. W.
The Vegetation of Southern Florida,
W79-02425 2I

LORENTZEN, A. P.
Oil Sorbing Mat,
W79-02309 5G

LOUBOUTIN, R.
Water Treatment Apparatus and Method,
W79-02333 5F

LUGO, A.
Forested Wetlands of Florida-Their Management and Use,
W79-02112 6B

LUMME, P. O.
Analyses of Paper Machine Waters with Ion Specific Electrodes. Part V. Sulfide Determination Using Ag(+) Ion Specific Electrode and Various Measurement Methods,
W79-02388 5A

LUNDY, J. D.
Stratigraphy and Hydrogeologic Correlation Studies in Several Cypress Domes-North Central Florida,
W79-02259 5E

LUNING, K.
Effects of Nitrate Concentration on the Growth and Physiology of Lominaria Saccharina (Phaeophyta) in Culture,
W79-02010 5C

LUSH, D. L.
Particulate and Dissolved Organic Matter in a Small Partly Forested Ontario Stream,
W79-02252 5C

The Uptake of Dissolved Organic Matter by a Small Spring Stream,
W79-02248 5C

MACALUSO, S.
Oil Salvager,
W79-02315 5G

MACCRIMMON, H. R.
Nutrients in Subsurface and Runoff Waters of the Holland Marsh, Ontario,
W79-02428 5C

MACK, H. J.
Yield Response to Soil Warming: Agronomic Crops,
W79-02490 3F

MACLACHLAN, D. B.
Geology and Groundwater Resources of Northern Berks County, Pennsylvania,
W79-02132 2F

MAKEPEACE, J.
Winery Wastewater Characteristics and Treatment,
W79-02297 5D

MALLORY, R.
Making the Desert Flower: Irrigating California's Imperial Valley,
W79-02092 3F

MALVIK, O.
Geophysical Delineation of Buried Glacial River Valley Aquifers in Grundy County, Missouri,
W79-02154 2F

MANAHAN, S. E.
Atomic Absorption Detector for Chromium Organometallic Compounds Separated by High Speed Liquid Chromatography,
W79-02080 5A

Measurement of Chelating Agent Levels in Media with High Concentrations of Interfering Metal Ions,
W79-02079 5A

MAPLES, P. D.
Reverse Osmosis Water Unit,
W79-02329 5F

MARCELLUS, K. L.
Angiosperm Production of Three Virginia Marshes in Various Salinity and Soil Nutrient Regimes,
W79-02108 2L

MARIN, A.
The Choice of Efficient Pollution Policies: Technology and Economics in the Control of Sulphur Dioxide,
W79-02038 5G

MARKHAM, J. W.
Effects of Nitrate Concentration on the Growth and Physiology of Lominaria Saccharina (Phaeophyta) in Culture,
W79-02010 5C

MARLEY, C. F.
Full-Season Rain Gauge Having Replaceable Charts for Making Profile Graphs,
W79-02304 7B

MARSH, J. R.
Treatment Effectiveness for the Removal of Selected Contaminants from Drinking Water,
W79-02435 5F

MARSH, P.
Analysis of Error in the Determination of Snow Storage for Small High Arctic Basins,
W79-02197 2C

MARSHALL, D. W.
Investigations of Heat Treatment for Paper Mill Sludge Conditioning,
W79-02296 5E

MARTENS, C. S.
Interstital Water Chemistry of Anoxic Long Island Sound Sediments. 2. Nutrient Regeneration and Phosphate Removal,
W79-02243 5C

MASON, E.
Natural Resources and Environmental Restrictions to Growth,
W79-02056 6G

MATALAS, N. C.
Some Comparisons of Flood Statistics in Real and Log Space,
W79-02119 2E

MATSUOKA, I.
Flow Characteristics of Streams in Tutuila, American Samoa,
W79-02124 2E

MATTRAW, H. C.
Comparison of the Predictive Accuracy of Models of Urban Flow and Water-Quality Processes,
W79-02253 5B

MATULEWICH, V. A.
Significance of Nitrification in Stream Analysis-Effects on the Oxygen Balance,
W79-02001 5C

MAURER, D.
Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay,
W79-02223 5C

MAYNORD, S. T.
Practical Riprap Design,
W79-02351 8B

MCCLURE, C. A.
Flow Monitoring,
W79-02330 8G

MCCLURKIN, D. C.
Consequences of Site Disturbances in the Upper Coastal Plain,
W79-02431 4D

MCCREERY, R. A.
Differential Effect of Bermuda and Bahiagrasses on Soil Chemical Characteristics,
W79-02381 3F

MCINERNEY, J.
On the Optimal Policy for Exploiting Renewable Resource Stocks,
W79-02040 6B

MCKELL, C. M.
Establishment of Native Plants for the Rehabilitation of Paraho Processed Oil Shale in an Arid Environment,
W79-02391 4A

MCKOWN, M. M.
Investigation of Matrix Interferences for AAS Trace Metal Analyses of Sediments,
W79-02143 5A

MCLAREN, A. D.
Reduction of Nitrate in a Soil Column During Continuous Flow,
W79-02366 2G

MCLEESE, R. L.
Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands: Soil Relationships,
W79-02429 6G

MCNAUGHT, D. C.
Application of a Model of Zooplankton Composition to Problems of Fish Introductions to the Great Lakes,
W79-02020 5C

MCNEASE, L.
Alligator Diets in Relation to Marsh Salinity,
W79-02118 2L

Effects of Simulated Flooding on Alligator Eggs,
W79-02116 2L

MCRAE, J. J.
Optimal and Competitive Use of Replenishable Natural Resources by Open Economies.
W79-02058 6C

MEALE, E. R.
Consumer Surplus and Economic Rent Estimates of Recreation Value: An Empirical and Theoretical Comparison,
W79-02290 6B

MEEKS, R. L.
The Effect of Drawdown Date on Wetland Plant Succession,
W79-02424 2I

MEHTA, D. J.
Processing of Pulp and Paper Industry Waste by Reverse Osmosis for Pollution Control,
W79-02373 5D

MEINERS, A. F.
Wastewater Treatment Technology Documentation for DDT Manufacture,
W79-02444 5D

Wastewater Treatment Technology Documentation for Toxaphene Manufacture,
W79-02439 5D

MEIRI, A.
Transpiration Effects on Leaching Fractions.
W79-02019 3C

MEJER, H.
Examination of a Lake Model.
W79-02007 5C

MENDELSSOHN, I. A.
Angiosperm Production of Three Virginia Marshes in Various Salinity and Soil Nutrient Regimes,
W79-02108 2L

MERCER, L. J.
Measurement of Economic Uncertainty in Public Water Resource Development: An Extension,
W79-02050 6B

MICHEL, H. V.
A Statistical Evaluation of Some Columbia River Basalt Chemical Analysis,
W79-02433 5A

MIDDLEBROOKS, E. J.
Manpower Utilization and Future Needs of Manufacturing Industries in Water Pollution Control,
W79-02438 5G

MILES, P.
Novel Compositions of Matter for Use in the Treatment of Aqueous Systems,
W79-02335 5F

MILLER, J. D.
Design and the Desert Environment: Landscape Architecture in the American Southwest,
W79-02389 3B

MILLER, J. S.
Drillers Find Increasing Use for Plastic Pipe,
W79-02177 8G

MILLER, L.
Economic Impact of Alternative Stormwater Drainage Systems,
W79-02289 5D

MILLS, A. L.
Effects of Ingesting Mercury-Containing Bacteria on Mercury Tolerance and Growth Rates of Ciliates,
W79-02499 5C

MINER, J. R.
Protein Production Rates by Algae Using Swine Manure as a Substrate,
W79-02489 5D

MIYAHARE, S.
The Pollution of Sea-Water in Nagasaki Bay in Summer 1976 and 1977, (In Japanese),
W79-02482 5B

MOEHRING, D. M.
Consequences of Site Disturbances in the Upper Coastal Plain,
W79-02431 4D

MOHEREK, A. J.
Flume Experiments on Sand, Silt, and Clay Mixtures from the Offshore Dredged Material Disposal Site, Galveston, Texas,
W79-02348 5E

MOHRAZ, B.
Strength and Behavior of Thick Waled Reinforced Concrete Conduits,
W79-02217 8F

MOLINE, W. N.
Innovative Water System Solves Quality Problem,
W79-02183 5G

MOLLER, H.
Ecological Effects of Cooling Water of a Power Plant at Kiel Fjord,
W79-02461 5C

MOREL-SEYTOUX, H. J.
Development of a Stream-Aquifer Model Suited for Management,
W79-02450 4B

MORGAN, W. D.
Measurement of Economic Uncertainty in Public Water Resource Development: An Extension,
W79-02050 6B

MORRIS, G. R.
Handling and Disposal of Sludges from Combined Sewer Overflow Treatment. Phase II - Impact Assessment,
W79-02303 5D

MORSE, J. W.
The Distribution and Form of Phosphorus in North Atlantic Ocean Deep-Sea and Continental Slope Sediments,
W79-02230 5B

MULLER, R. A.
Econometric Analysis of Environmental Policy: Estimation of a Model of the Canadian Pulp and Paper Industry,
W79-02046 6B

MULLER, R. N.
Chemical Characterization of Local and Stratospheric Plutonium in Ohio Soils,
W79-02320 5A

MUMMA, C. E.
Wastewater Treatment Technology Documentation for DDT Manufacture,
W79-02444 5D

Wastewater Treatment Technology Documentation for Toxaphene Manufacture,
W79-02439 5D

MUNARI, A. C.
Evapotranspiration Estimates for Water Right Transfers,
W79-02491 2D

MURACHI, S.
Blood Corpuscle Resistance of Carp Died of Environmental Hypoxia and of Cyanide Poisoning, (In Japanese),
W79-02471 5C

MURPHY, W. R. JR.
Magnitude and Frequency of Flooding on the Myakka River, Southwest Florida,
W79-02129 4A

MURTHY, M. S.
Eco-Biochemical Studies on Some Economically Important Intertidal Algae from Port Okha (India),
W79-02475 5C

MUSCATINE, L.
The Uptake, Retention, and Release of Ammonium by Reef Corals,
W79-02228 5C

MYERS, C. W.
A Statistical Evaluation of Some Columbia River Basalt Chemical Analysis,
W79-02433 5A

MYERS, T. R.
The Productivity of Lake Champlain wit Regard to Waterfowl, Furbearers, and Other Wildlife,
W79-02114 2H

NAKANISHI, T.
Studies on the Effects of the Environment on the Heart Rate of Shellfishes. II. Effects of Temperature, Low Salinity and Hypoxia on the Heart Rate of an Abalone Haliotis (Nordotis) Discus Hannai Ino. (In Japanese),
W79-02497 5C

NAKANO, N.
Effects of Forest Workings on Streamflow and Water Quality (Part I),
W79-02005 5C

NANBA, K.
Blood Corpuscle Resistance of Carp Died of Environmental Hypoxia and of Cyanide Poisoning, (In Japanese),
W79-02471 5C

NARINSKII, D. A.
Experience with Drum Dryers for Activated Sludge (Opyt naladki barabannykh sushilok aktivnogo ila),
W79-02385 5E

NEELY, W. B.
A Material Balance Study of Polychlorinated Biphenyls in Lake Michigan,
W79-02017 5C

NEMETZ, P. N.
The Effects of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-02498 5G

NEW, L.
Calculating the Cost of Each Irrigation,
W79-02094 3F

NICHOLLS, K. H.
An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships of Lakes,
W79-02247 5C

Nutrients in Subsurface and Runoff Waters of the Holland Marsh, Ontario,
W79-02428 5C

NIERING, W. A.
Biochemical and Transpiration Studies of the Growth Form of Spartina Alterniflora on Connecticut Salt Marshes,
W79-02101 2I

NISSENBAUM, A.
Hula Valley Peat: Review of Chemical and Geochemical Aspects,
W79-02365 2K

NOBLE, C. M.
Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation,
W79-02354 8B

NOEL, S. D.
Subsurface Stratigraphy and Water Resources of Cass County, Indiana,
W79-02185 4B

NOFZIGER, D. L.
Material Content of Binary Physical Mixture as Measured with a Dual-Energy Beam of Gamma Rays,
W79-02356 2G

NOKES, J. M.
Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W79-02123 10D

NOMIKOS, L. I.
Sulfate Turpentine in Unpurified and Purified Effluents from the Baikal Pulp Mill (Sul'fatnyi skipidar v neochishchennykh i ochishchennykh stokakh Baikal'skogo Tsellyuloznogo Zavoda),
W79-02378 5B

NOORY, M.
An Evaluation of Isotope Concentrations in the Ground Water of Saudi Arabia,
W79-02254 2F

NORCIO, N. V.
Physiological Aspects of Water Use Efficiency,
W79-02449 2I

NORING, J.
Drive Device for Rake Arm with Attached Screen Comb in Cleaning Device for a Water Conduit Screen,
W79-02306 8C

NOVAK, P.
Oxygen Transfer at Hydraulic Structures,
W79-02202 5G

NOWACKI, J.
Use of the Activated Sludge Process in Purifying Waste Waters from Pulp Production, Especially Kraft Pulp Production (Anwendung des Belebtschlammverfahrens zur Reinigung von Abwaessern aus der Zellstoffproduktion, insbesondere der Sulfatzellstoffproduktion),
W79-02371 5D

NYHOLM, N.
A Simulation Model for Phytoplankton Growth and Nutrient Cycling in Eutrophic, Shallow Lakes,
W79-02008 5C

ODUM, H. T.
Cypress Wetlands for Water Management, Recycling and Conservation (Third Annual Report, November 1, 1975 to December 15, 1976),
W79-02256 2I

Forested Wetlands of Florida-Their Management and Use,
W79-02112 6B

OGASAWARA, H.
Desalination in the Reuse of Industrial Waste Water,
W79-02383 5D

OGURI, M.
You Can Tailor Effluent BOD to Fit the Receiving-Water Ecosystem...and Enhance the Environment. Urban and Fish-Processing Wastes in the Marine Environment: Bioenhancement Studies at Terminal Island, California,
W79-02164 5E

OHLHORST, C. W.
Quantitative Mapping by Remote Sensing of an Ocean Acid-Waste Dump,
W79-02407 5A

OHNO, H.
The Pollution of Sea-Water in Nagasaki Bay in Summer 1976 and 1977, (In Japanese),
W79-02482 5B

OKORIE, P. E.
Effect of Sewage Effluent in Cypress Ponds on Growth of Surrounding Pine Seedlings and Trees,
W79-02274 5C

Effect of Sewage Effluent in Cypress Ponds on Surrounding Soil Moisture and Nutrient Content and on Growth of Pine Trees (Summary of MS Thesis),
W79-02273 5C

OLAMI, Y.
The Water Supply System of Caesarea Maritima,
W79-02399 8B

OLDFIELD, J. E.
Protein Production Rates by Algae Using Swine Manure as a Substrate,
W79-02489 5D

OLFFERS, T.
Process for Reducing the Mercury Content of Industrial Waste Waters,
W79-02313 5D

OLIN, S.
Procedure for the Evaluation of Environmental Monitoring Laboratories,
W79-02149 5A

ORDWAY, J.
The Projected Cost of Cypress Wetland Disposal for Waldo, Florida,
W79-02286 5E

ORDWAY, J. W.
Cypress Wetlands for Water Management, Recycling and Conservation (Third Annual Report, November 1, 1975 to December 15, 1976),
W79-02256 2I

ORNES, W. H.
The Autecology of Sawgrass in the Florida Everglades,
W79-02104 2L

OSTERKAMP, W. R.
Gradient, Discharge, and Particle-Size Relations of Alluvial Channels in Kansas, With Observations on Braiding,
W79-02120 2J

OWONUBI, J. J.
The Micro-Climate of Narrow- and Wide-Row Sorghum With Equal Plant Densities,
W79-02358 2D

PALMISANO, A. W.
Food Habits of Coastal Marsh Raccoons with Observations of Alligator Nest Predation,
W79-02117 2L

PARASHER, C. D.
Effect of Hexachlorobenzene (HCB) on Photosynthetic Oxygen Evolution and Respiration of Chlorella Pyrenoidosa,
W79-02480 5C

PARKS, L. L.
Water Utilization and Reallocation in Chile: A Study of the Pirque Valley,
W79-02053 6B

PARNAS, H.
Model for Decomposition of Organic Material by Microorganisms,
W79-02415 2G

PATRICK, W. H. JR.
Effect of Dissolved Oxygen and Redox Potential and Nitrate Removal in Flooded Swamp and Marsh Soils,
W79-02426 5C

PAUL, S. N.
Polyquaternary Compounds for the Control of Microbiological Growth,
W79-02331 5D

PAULSON, O. L. JR.
Dredge Spoil in Mississippi Sound,
W79-02188 5E

PAWLITZ, H.
Differential Elimination of Phenol by Diatoms and Other Unicellular Algae from Low Concentrations,
W79-02486 5C

PEARSON, F. J. JR.
Tritium in the Waters of Yellowstone National Park,
W79-02130 2F

PEARSON, R. G.
The Effects of Weed-Cutting on the Macro-Inverterate Fauna of a Canalised Section of the River Hull, A Northern English Chalk Stream,
W79-02002 5C

PELEG, Y.
The Water Supply System of Caesarea Maritima,
W79-02399 8B

PEMBROKE, A.
Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay,
W79-02223 5C

PERRY, G.
Effects of Simulated Flooding on Alligator Eggs,
W79-02116 2L

PETERSEN, R. C.
Tire Module Systems in Shore and Harbor Protection,
W79-02201 8G

PETERSON, R. J.
New Membranes for Treating Metal Finishing Effluents by Reverse Osmosis,
W79-02300 5D

PFEFFER, J. B.
Drainage Device for Particulate Material,
W79-02326 5D

PHAM, C. H.
Precipitation and Runoff Water Quality from an Urban Parking Lot and Implications for Tree Growth,
W79-02387 5B

PHILLIPS, C. A.
Anion Exchange Method for the Determination of Plutonium in Water: Single-Laboratory Evaluation and Interlaboratory Collaborative Study,
W79-02145 5A

PHILLIPS, T. G.
Screening -- A Novel Approach to Primary Treatment,
W79-02363 5D

PHINNEY, H. K.
Protein Production Rates by Algae Using Swine Manure as a Substrate,
W79-02489 5D

PICHON, J.
Device for the Removal of a Liquid Layer on Water,
W79-02337 5G

PILSON, M. E. Q.
Systematic Absorbance Errors with Technicon AutoAnalyzer II Colorimeters,
W79-02074 2K

PISAREVA, T. N.
Sulfate Turpentine in Unpurified and Purified Effluents from the Baikal Pulp Mill (Sul'fatnyi skipidar v neochishchennykh i ochishchennykh stokakh Baikal'skogo Tsellyuloznogo Zavoda),
W79-02378 5B

PITKIN, P. H.
Intertidal Environment of Northern Dublin Bay,
W79-02204 5B

PITT, W. A. J. JR.
Water Quality in the Old Plantation Water Control District, Broward County, Florida-Progress Report, July 1976-June 1977,
W79-02127 5B

PLOURDE, C. G.
Exploitation of Common-Property Replenishable Natural Resources,
W79-02070 6B

POE, W. E.
Amino Acids in Salt Marsh Detritus,
W79-02086 5C

POESEN, J.
Splash and Discontinuous Runoff as Creators of Fine Sandy Lag Deposits with Kalahari Sands,
W79-02393 2J

POLLARD, J. E.
Macroinvertebrate Sampling Techniques For Streams in Semi-Arid Regions: Comparison of the Surber Method and A Unit-Effort Traveling Kick Method,
W79-02146 5A

POMYTKIN, B. A.
Seiches in the Baltic Sea and Their Effect on Floods in the Neva River Delta,
W79-02213 2L

PONCE, S. L.
Range Cattle Impacts on Stream Water Quality in the Colorado Front Range,
W79-02386 5G

POPKIN, B. P.
Water-Quality Monitoring in the American Urbanizing Southwest,
W79-02397 5B

POST, D. M.
Rates of Growth and Nutrient Concentrations of Trees in Cypress Domes,
W79-02271 5C

POSTMA, H.
The Nutrient Contents of North Sea Water: Changes in Recent Years, Particularly in the Southern Bight,
W79-02468 5B

POWER, J. A. JR.
High Plans - Ogallala Groundwater Studies,
W79-02172 4B

POWERS, W. L.
The Micro-Climate of Narrow- and Wide-Row Sorghum With Equal Plant Densities,
W79-02358 2D

PRAHACS, S.
Toxicity, BOD, and Color of Effluents from Novel Bleaching Processes,
W79-02374 5C

PRESSLEY, T. A.
Partial Characterization of Chlorinated Organics in Superchlorinated Septages and Mixed Sludges,
W79-02413 5D

PYKE, R. M.
Liquefaction Potential of Hydraulic Fills,
W79-02203 8D

RACZ, G. J.
Mechanism of Zinc Adsorption by Iron and Aluminum Oxides,
W79-02359 2K

Reaction Products and Solubility of Applied Zinc Compounds in Some Manitoba Soils,
W79-02362 2K

RADIA, P.
Eco-Biochemical Studies on Some Economically Important Intertidal Algae from Port Okha (India),
W79-02475 5C

RAMSAY, A.
Comparison of Fall Birds Present in a Natural Cypress Dome, and the Adjacent Pine Plantation,
W79-02280 5C

RANDALL, A. D.
A Contribution to the Lake Pleistocene Stratigraphy of the Susquehanna River Valley of New York,
W79-02135 2J

RAO, A. V.
Processing of Pulp and Paper Industry Waste by Reverse Osmosis for Pollution Control,
W79-02373 5D

RAVINA, I.
Application of the Electrical Double Layer Theory to Predict Ion Absorption in Mixed Ionic Systems,
W79-02314 2K

RECHARD, P. A.
Evapotranspiration Estimates for Water Right Transfers,
W79-02491 2D

REED, R. E.
Fresh Water Supply and Waste Water Retention System,
W79-02317 5G

REES, J.
Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

REILINGER, R.
Land Subsidence Due to Water Withdrawal in the Vicinity of Pecos, Texas,
W79-02396 4B

REIM, R. L.
The Characterization of Bacillus Capable of Blue-Green Bactericidal Activity,
W79-02159 5D

REISENAUER, H. M.
Ammonium Effects on Nutrient Cation Absorption by Wheat,
W79-02021 3F

RENZ, G.
Planning and Startup of a Flexible Activated Sludge Installation (Bioflex Process) as a Biological Clarification Stage in a Board Mill (Planung und Inbetriebnahme einer flexiblen Belebtschlammanlage (Bioflex-Verfahren) als biologische Klaerstufe einer Kartonfabrik),
W79-02361 5D

REW, A.
Urban Water: Access, Delivery and Institutional Scarcity,
W79-02036 6E

REYNOLDS, W. R.
Trace Element of the Sardis Reservoir, Mississippi, as Related to Clay Mineral Dispersion,
W79-02187 2H

RICHARD, M. R.
Dual Water Supplies: An Idea for the Future,
W79-02175 3D

RICHARDSON, N.
Novel Compositions of Matter for Use in the Treatment of Aqueous Systems,
W79-02335 5F

RICKETTS, M.
Pricing and Standards in the Control of Pollution,
W79-02057 5G

RIGGS, D. B.
Changing Manner and Place of Use of Water Rights in Wyoming, Comments,
W79-02083 6E

RINALDI, S.
Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

RIOPELLE, L. A.
Ecosystem Analyses at Corkscrew Swamp,
W79-02282 2I

ROBE, R. Q.
Physical Properties of Icebergs, Part I--Height to Draft Ratios of Icebergs, Part II--Mass Estimation of Arctic Icebergs,
W79-02216 2C

ROBERTS, M. G.
The Colonization of Cabora Bassa, Mocambique, A New Man-Made Lake, by Floating Aquatic Macrophytes,
W79-02231 4A

ROBSON, A. J.
Costly Innovation and Natural Resources,
W79-02062 6B

ROGENRUD, S.
Recent Changes in Plankton Communities and Present Trophic State of Lake Steinsfjord,
W79-02250 5C

ROGERS, R. D.
Volatility of Mercury from Soils Amended with Various Mercury Compounds,
W79-02142 5B

ROLLER, J. A.
Innovative Water System Solves Quality Problem,
W79-02183 5G

ROSENBERG, D. G.
Assessment of Hazardous Waste Practices in the Petroleum Refining Industry,
W79-02440 5D

ROSENBERGER, D. R.
Considerations in Conducting Bioassays,
W79-02349 5A

ROSENFELD, J. K.
Interstital Water Chemistry of Anoxic Long Island Sound Sediments. 2. Nutrient Regeneration and Phosphate Removal,
W79-02243 5C

ROSENKRANZ, W. A.
Advances in Storm and Combined Sewer Pollution Control Abatement Technology,
W79-02437 5D

ROSEPILER, M. J.
Land Subsidence Due to Water Withdrawal in the Vicinity of Pecos, Texas,
W79-02396 4B

ROSS, R.
Water Quality Can Affect Management Planning,
W79-02096 5G

RUBY, C. H.
The Urquiola Oil Spill, La Coruna, Spain: Impact and Reaction on Beaches and Rocky Coasts,
W79-02500 5C

RUDOLPH, S.
Drive Device for Rake Arm with Attached Screen Comb in Cleaning Device for a Water Conduit Screen,
W79-02306 8C

RUSSELL, G. M.
Water Quality in the Old Plantation Water Control District, Broward County, Florida-Progress Report, July 1976-June 1977,
W79-02127 5B

RUSSELL, P. H. JR.
Winery Wastewater Characteristics and Treatment,
W79-02297 5D

RUZICKA, G. C.
Strength and Behavior of Thick Waled Reinforced Concrete Conduits,
W79-02217 8F

RYKBOST, K. A.
Yield Response to Soil Warming: Agronomic Crops,
W79-02490 3F

SADANA, A. J.
Involvement of Free Radicals in the Aqueous-Phase Catalytic Oxidation of Phenol Over Copper Oxide,
W79-02166 5D

SAGER, R. A.
Physical Model Simulation of the Hydraulics of Masonboro Inlet, North Carolina,
W79-02353 8B

SANDER, J. E.
The Blind Zone in Seismic Ground-Water Exploration,
W79-02190 4B

SANDER, W.
Studying the Economics of a Waterway: A Critique of Studies of the McClellan-Kerr Arkansas River Navigation System,
W79-02052 6B

SANDERSON, E. W.
Public Groundwater Supplies in Kane County,
W79-02075 4B

SANDUSKY, J. C.
A Pattern Analysis of Clear Lake Phytoplankton,
W79-02227 5C

SATO, Y.
The Effect of Silt-Fence on the Prevention of Sea Water Siltation Caused by Dredging and Reclaiming Work in Harbor, (In Japanese),
W79-02481 5C

SAVAT, J.
Splash and Discontinuous Runoff as Creators of Fine Sandy Lag Deposits with Kalahari Sands,
W79-02393 2J

SCAVIA, D.
Application of a Model of Zooplankton Composition to Problems of Fish Introductions to the Great Lakes,
W79-02020 5C

SCHAEFER, W.
Method of Clarifying Industrial Waste Water,
W79-02312 5D

SCHLEICHER, J.
Drip Study Shows up to 30% Water Savings,
W79-02090 3F

SCHMIED, J.
Possibility of Rendering Bleachery Effluents Harmless by Technological Changes (Ueber die Moeglichkeit Bleichereiabwaesser durch technologische Aenderungen unschaedlich zu machen),
W79-02360 5G

SCHMIEDER, P. K.
Bioaccumulation Potential and Acute Toxicity of Synthetic Fuels Effluents in Freshwater Biota: Azaarenes,
W79-02241 5C

SCHMISSEUR, W. E.
Yield Response to Soil Warming: Agronomic Crops,
W79-02490 3F

SCHREIBER, A.
Drive Device for Rake Arm with Attached Screen Comb in Cleaning Device for a Water Conduit Screen,
W79-02306 8C

SCHREINER, U. J.
Structuring Water Utility Bond Issues to Cope with Inflation,
W79-02024 6C

SCHRODER, V. R.
The Release of Plant Nutrients from Reed Borders and its Transport into the Open Waters of the Bodensee-Untersee, (In German),
W79-02422 5C

SCHUBEL, J. R.
Distribution of Surficial Sediments and Eelgrass in New York's South Shore Bays: An Assessment from the Literature,
W79-02162 2L

Transportation and Accumulation of Fine-Grained Sediments in the Estuarine Environment: Recommendations for Research,
W79-02165 2L

SCHULTES, J. F. SR.
Two Drilling Methods Compared,
W79-02169 8B

SCHULZE-WIEHENBRAUCK, H.
Influence of Water Soluble Excreta on Oxygen Consumption of Tilapia Zillii,
W79-02462 5C

SCHWINTZER, C. R.
Vegetation Changes in a Small Michigan Bog from 1917 to 1972,
W79-02091 2H

SCOTT, A.
Optimal Utilization and the Control of Fisheries,
W79-02065 6B

SCOTT, A. E. JR.
Water Systems Basics, (2),
W79-02181 8C

SCOTT, E. A. JR.
Water Systems Basics, (1),
W79-02180 8C

SCULLY, L. J. P.
Characterization and In-Plant Reduction of Wastewater from Hog Slaughtering Operations,
W79-02298 5D

SEABERGH, W. C.
Physical Model Simulation of the Hydraulics of Masonboro Inlet, North Carolina,
W79-02353 8B

SEBELIK, R. V.
Method of Clarifying Industrial Waste Water,
W79-02312 5D

SEGALL, F.
A Computer Simulation of Phosphate and Nitrogen Transport by Water Runoff,
W79-02251 5B

SEGINER, I.
Wind, Sprinkler Patterns, and System Design,
W79-02368 3F

SEIKI, Y.
Apparatus for Collecting Effluent Oil,
W79-02339 5G

SELIVANOV, R. I.
Mechanism of Formation and Forecast of the Development of the Volga Delta,
W79-02210 2J

SENFT, W. H.
Dependence of Light-Saturated Rates of Algal Photosynthesis on Intracellular Concentrations of Phosphorus,
W79-02236 5C

SERDOBOL'SKII, E. N.
Purification of Kraft Pulping Effluents by Electrochemical Oxidation (Ochistka stokov sul'fatno-tsellyuloznogo proizvodstva elektrokhimicheskim okisleniem),
W79-02380 5D

SHAFER, D.
Nutrient and Particulate Fluxes in a Salt Marsh Ecosystem: Tidal Exchanges and Inputs by Precipitation and Groundwater,
W79-02235 5C

SHAIR, S. A.
Polyquaternary Compounds for the Control of Microbiological Growth,
W79-02331 5D

SHALHEVET, J.
Transpiration Effects on Leaching Fractions,
W79-02019 3C

SHAMPINE, W. J.
An Evaluation of Isotope Concentrations in the Ground Water of Saudi Arabia,
W79-02254 2F

SHANE, M. S.
The Characterization of Bacillus Capable of Blue-Green Bactericidal Activity,
W79-02159 5D

SHARER, G. R.
Root Production and Root Turnover in a Wet Tundra Ecosystem, Barrow, Alaska,
W79-02100 2I

SHEA, M. L.
Biochemical and Transpiration Studies of the Growth Form of Spartina Alterniflora on Connecticut Salt Marshes,
W79-02101 2I

SHEEHAN, M.
Coordinating Public Utility Expansion, Industrial Siting and Pollution Control: A Working Dynamic Programming Algorithm,
W79-02039 5G

SHELDON, R. B.
Maximum Depth Inhabited by Aquatic Vascular Plants,
W79-02249 5C

SHERIDAN, P.
Compositions and Processes for the Dispersing of Oil Spillages,
W79-02325 5G

SHOJALASHKARI, R.
Optimal Configuration of the Cooling System for Power Generation,
W79-02081 5G

SINGER, A.
The Nature of Basalt Weathering in Israel,
W79-02238 2G

SINGH, T.
Zinc Nutrition of Rice as Influenced by Rates of Gypsum and Zn Fertilizaton of Alkali Soils,
W79-02099 3F

SIPPLE, W. S.
An Atlas of Vascular Plant Species Distribution Maps for Tidewater maryland,
W79-02109 2I

A Bibliography of Maryland's Tidal Wetlands (Marshes-Swamps),
W79-02111 2L

A Review of the Biology, Ecology, and Management of Scirpus Olneyi, Volume I: An Annotated Bibliography of Selected References,
W79-02110 2I

SIRRINE, K. L.
Winery Wastewater Characteristics and Treatment,
W79-02297 5D

SIVARAJAH, K.
The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

SKOGHEIM, O. K.
Recent Changes in Plankton Communities and Present Trophic State of Lake Steinsfjord,
W79-02250 5C

SMITH, D. F.
Photosynthetic Rates of Marine Algae as a Function of Inorganic Carbon Concentration,
W79-02224 5C

SMITH, J. K.
Evaluation of Semipermeable Membranes for Concentration or Organic Contaminants in Drinking Water,
W79-02405 5A

SMITH, S. J.
Residual Forms of Fertilizer Nitrogen in Field Soils,
W79-02364 2K

SMITH, T. K.
Land Use and Intensive Range Management in the Sierra Nevada Foothills--A Contemporary Analysis,
W79-02293 4D

SMITH, V. H.
Storm Derived Losses of Phosphorus and their Significance to Annual Phosphorus Export from Two New Jersey Watersheds,
W79-02151 5B

SMITH, V. K.
Measuring Natural Resources Scarcity: Theory and Practice,
W79-02059 6B

SMITH, V. L.
Economics of Wilderness Resources,
W79-02072 6B

General Equilibrium with a Replenishable Natural Resource,
W79-02068 6B

SMITH, W.
Rates of Growth and Nutrient Concentrations of Trees in Cypress Domes,
W79-02271 5C

SMYLY, W. J. P.
The Crustacean Zooplankton of Grasmere Before and After a Change in Sewage Effluent Treatment,
W79-02458 5C

SONCINI-SESSA, R.
Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

SOULE, D. F.
You Can Tailor Effluent BOD to Fit the Receiving-Water Ecosystem...and Enhance the Environment. Urban and Fish-Processing Wastes in the Marine Environment: Bioenhancement Studies at Terminal Island, California,
W79-02164 5E

SOULE, J. D.
You Can Tailor Effluent BOD to Fit the Receiving-Water Ecosystem...and Enhance the Environment. Urban and Fish-Processing Wastes in the Marine Environment: Bioenhancement Studies at Terminal Island, California,
W79-02164 5E

SOULE, P. L.
Flood-Plain Delineation for Cub Run Basin, Fairfax County, Virginia,
W79-02137 2E

SOUTHWORTH, G. R.
Bioaccumulation Potential and Acute Toxicity of Synthetic Fuels Effluents in Freshwater Biota: Azaarenes,
W79-02241 5C

SPANGLER, D. P.
Stratigraphy and Hydrogeologic Correlation Studies in Several Cypress Domes-North Central Florida,
W79-02259 5E

SPARLING, J. H.
Water Level Fluctuation in a Northeastern Ontario Peatland,
W79-02105 2H

SPEEDY, R. J.
Supercooling of Water to -92 Degrees C Under Pressure,
W79-02494 2C

SPOLJARIC, N.
Subsurface Geological Investigation of a Pleistocene Braided Stream in the Northern Coastal Plain, Delaware (U.S.A.),
W79-02167 2J

STEEL, A. J.
Compositions and Processes for the Dispersing of Oil Spillages,
W79-02325 5G

STEWARD, K. K.
The Autecology of Sawgrass in the Florida Everglades,
W79-02104 2L

STEWART, I. M.
Asbestos in the Water Supplies of the Ten Regional Cities, Part I,
W79-02441 5A

STILES, L. H.
Improved Techniques for Evaluating Carbonate Waterfloods in West Texas,
W79-02182 4B

STOECKELER, J. H.
Wetland Road Crossing: Drainage Problems and Timber Damage,
W79-02421 4C

STOICHKOV, K.
Operation of the (Effluent) Purification Equipment at the Razlog Pulp and Paper Mill (Opit ot rabota na prechisvatelnata stantsiya kem KTsKh Razlog),
W79-02367 5D

STONE, P. A.
The Organic Sediments of Corkscrew Swamp Sanctuary,
W79-02284 2H

STRANGE, J. R.
P-32 Uptake in Lentic Algae,
W79-02078 5C

STRANGE, R.
New Method for Recording Heart and Respiratory Rates in Catfish,
W79-02077 7B

STRAUB, P. A.
Rates of Growth and Nutrient Concentrations of Trees in Cypress Domes,
W79-02271 5C

STROM, P. F.
Significance of Nitrification in Stream Analysis-Effects on the Oxygen Balance,
W79-02001 5C

STRUBLE, J. E.
Nitrogen Transformations in Water and Sediments of Cypress Domes with and without Added Sewage Effluent,
W79-02276 2H

Sedimentation Rates: Cypress Domes,
W79-02275 5C

STUDLICK, J. R. J.
The Need for Professionalism and its Attributes in Hydrogeology,
W79-02174 6E

SULLIVAN, C. Y.
Physiological Aspects of Water Use Efficiency,
W79-02449 2I

SUNDARAM, S.
Virus Transport Through Solid Beds,
W79-02447 5B

SUNDARARAJ, B.
Thermal Tolerance and Preference of the Indian Catfish Heteropneustes Fossilis,
W79-02455 5C

SWANSON, S.
Analysis of the Environmental Control Technology for Oil Shale Development,
W79-02432 5G

SWARTZENDRUBER, D.
Electrical Potentials During Water Entry into an Air-Dry Mixture of Sand and Kaolinite,
W79-02357 2G

Material Content of Binary Physical Mixture as Measured with a Dual-Energy Beam of Gamma Rays,
W79-02356 2G

Streaming-Potential Effects in Saturated Water Flow Through a Sand-Kaolinite Mixture,
W79-02160 2G

Water Infiltration into Uniform and Stratified Soils I. Review and Use of an Approximate Theory,
W79-02492 2G

Water Infiltration into Uniform and Stratified Soils II. Experimental Evaluation of an Approximate Theory,
W79-02493 2G

SWEENEY, B. M.
Role of Inorganic Ions in Controlling Sedimentation Rate of a Marine Centric Diatom Ditylum Brightwelli,
W79-02014 5C

SWEENEY, R. A.
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix A: Planktonic Communities, Benthic Assemblages, and Fishery,
W79-02346 5E

SY, S. H.
Increasing Efficiency of Aquatic Plant Management Through Processing,
W79-02158 4A

TAGATZ, M. E.
Effect of Barite (BASO4) on Development of Estuarine Communities,
W79-02484 5C

TAKKAR, P. N.
Zinc Nutrition of Rice as Influenced by Rates of Gypsum and Zn Fertilizaton of Alkali Soils,
W79-02099 3F

TAN, K. H.
Differential Effect of Bermuda and Bahiagrasses on Soil Chemical Characteristics,
W79-02381 3F

TANNER, C. B.
Advection Modification of the Priestley and Taylor Evapotranspiration Formula,
W79-02395 2D

TARBUTTON, R. J.
Dredge Spoil in Mississippi Sound,
W79-02188 5E

TARQUIN, A. J.
Treatment of High Strength Meatpacking Plant Wastewater by Land Application,
W79-02301 5D

TATE, C. H. JR.
Bay Springs Canal Surge Study, Tennessee-Tombigbee Waterway, Mississippi and Alabama; Hydraulic Model Investigation,
W79-02352 8B

TATEM, H. E.
Aquatic Disposal Field Investigations Duwamish Waterway Disposal Site Puget Sound, Washington, Evaluative Summary,
W79-02350 5C

TEAL, J.
The Nature of Growth Forms in the Salt Marsh Grass Spartina Alterniflora,
W79-02087 2L

TENNANT, D. J.
Compositions and Processes for the Dispersing of Oil Spillages,
W79-02325 5G

TETT, P.
Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

THANH, P. C.
Growth and Optimal Growth with Renewable and Non Renewable Natural Resources,
W79-02032 6A

THOMAS, R. W.
Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

TITLOW, F. B.
Computer Assisted Instruction in Natural Resource Management,
W79-02161 7C

TOBIA, M.
Effect of Barite (BASO4) on Development of Estuarine Communities,
W79-02484 5C

TOBIN, R. L.
Limnology of Selected Lakes in Ohio - 1975,
W79-02126 2H

TOLKSDORF, W.
The Influence of Salinity and Temperature on Growth, Metabolism and Lethal Temperature of the Sand Goby, Pomatoschistus Microps K. (Der Einfluss Von Salzgehalt und Temperatur Auf Wachstum Stoffwechsel und Letaltemperatur Der Strandgrundel Pomatoschistus Microps K.),
W79-02466 5C

TORBIN, L.
Operation of the (Effluent) Purification Equipment at the Razlog Pulp and Paper Mill (Opit ot rabota na prechisvatelnata stantsiya kem KTsKh Razlog),
W79-02367 5D

TOWNEND, R. E.
Process for Recovering Proteinaceous Matter from Acid Whey and Tannery Unhairing Effluents,
W79-02334 5D

TRIMBLE, D.
Structural Control of the Rapids and Pools of the Colorado River in the Grand Canyon,
W79-02200 2E

TRUELSON, J.
Distribution of Chlorophyll in Cypress Ecosystems,
W79-02278 2I

TRUESDELL, A. H.
Tritium in the Waters of Yellowstone National Park,
W79-02130 2F

TSCHRIN, C. R.
Investigation of Matrix Interferences for AAS Trace Metal Analyses of Sediments,
W79-02143 5A

TUMBEVA, V.
Operation of the (Effluent) Purification Equipment at the Razlog Pulp and Paper Mill (Opit ot rabota na prechisvatelnata stantsiya kem KTsKh Razlog),
W79-02367 5D

TURK, J. T.
Apparent Use of Sediment Nitrogen and Phorphorus by Plants in Malletts Creek Marsh with Implications to Lake Champlain Water Level Regulation,
W79-02115 2H

TURNER, J. F. JR.
Magnitude and Frequency of Flooding on the Myakka River, Southwest Florida,
W79-02129 4A

TURNER, R. E.
Geographic Variations in Salt Marsh Macrophyte Productions: A Review,
W79-02098 2H

TURNER, R. K.
Research on Control Technology for Ice Fog From Mobile Sources,
W79-02147 5G

TURNER, R. M.
Drainage Map of Arizona Showing Perennial Streams and Some Important Wetlands,
W79-02121 7C

TURVEY, R.
Optimization and Suboptimization in Fishery Regulation,
W79-02066 6B

TUWINER, S. B.
Copper Sulfate Helps Control Micorganisms in Reservoirs,
W79-02018 5F

TYNER, W. E.
A Simulation Model for Resource Policy Evaluation,
W79-02025 6A

UNGER, P. W.
Tillage Effects on Winter Wheat Production Where the Irrigated and Dryland Crops are Alternated,
W79-02088 3F

UNNI, K. S.
Production of Submerged Aquatic Plant Communities of Doodhadhari Lake Raipur, (M. P. India),
W79-02419 2I

URSIN, E.
A Model of the Biological Effects of Eutrophication in the North Sea,
W79-02469 5C

VALIELA, I.
The Nature of Growth Forms in the Salt Marsh Grass Spartina Alterniflora,
W79-02087 2L

Nutrient and Particulate Fluxes in a Salt Marsh Ecosystem: Tidal Exchanges and Inputs by Precipitation and Groundwater,
W79-02235 5C

VAN GROENEWOUD, H.
Interim Recommendation for the Use of Buffer Strips for the Protection of Small Streams in the Maritimes,
W79-02384 5G

VAN HOVE HOLDRINET, M.
Organochlorine and Mercury Residues in Fish from Lake Simcoe, Ontario 1970-76,
W79-02456 5B

VAN STRATEN, G.
Wind Induced Dispersion and Algal Growth in Shallow Lakes,
W79-02226 5G

VASAL, S.
Thermal Tolerance and Preference of the Indian Catfish Heteropneustes Fossilis,
W79-02455 5C

VIGON, B. W.
The Role of Silica and the Vernal Diatom Bloom in Controlling the Growth of Nuisance Algal Populations in Lakes,
W79-02152 5C

VIRARAGHAVAN, T.
Economic Evaluation of Four Sludge Dewatering Devices,
W79-02037 5D

VISGILIO, G. R.
'The Relationship Between Firm and Fishery in Common Property Fisheries': Comment,
W79-02060 6B

VOGEL, W.
Method for Treating a Medium Containing Water with Coagulants,
W79-02322 5D

VOIGTS, D. K.
Aquatic Invertebrate Abundance in Relation to Changing Marsh Vegetation,
W79-02095 2H

VOLKMANN, J. M.
Nutrient and Particulate Fluxes in a Salt Marsh Ecosystem: Tidal Exchanges and Inputs by Precipitation and Groundwater,
W79-02235 5C

VONDER HAAR, S. P.
Hypersaline Lagoonal Deposits and Processes,
W79-02430 2L

WACHTER, R. A.
Source Assessment: Water Pollutants From Coal Storage Areas,
W79-02144 5B

WAGNER, F.
Analysis of the Environmental Control Technology for Oil Shale Development,
W79-02432 5G

WAGNON, A. L.
Apparatus for Collecting Debris Floating in a Stream,
W79-02328 5G

WALKER, W. R.
A Systematic Procedure for Taxing Agricultural Pollution Sources,
W79-02219 5G

WALKER, W. W.
Insecticide Persistence in Natural Seawater as Affected by Salinity, Temperature, and Sterility,
W79-02487 5B

WALLIS, J. R.
Some Comparisons of Flood Statistics in Real and Log Space,
W79-02119 2E

WALTERS, C. H.
Gravitational Separator for Mixtures of Immiscible Liquids of Different Densities,
W79-02336 5D

WANG, A.
Dynamic Analysis of Commercial Fishing Model,
W79-02063 6C

WANG, F. C.
Hydrologic Budget Model,
W79-02258 2H

WARREN, R. S.
Biochemical and Transpiration Studies of the Growth Form of Spartina Alterniflora on Connecticut Salt Marshes,
W79-02101 2I

WATLING, L.
Seasonal Fluctuation of Water Quality (Nutrients and Pigments) in Lower Delaware Bay,
W79-02223 5C

WEBB, M. G.
Pricing and Standards in the Control of Pollution,
W79-02057 5G

WEBBER, M. D.
Effects of Temperature and Time on Hydroxy Aluminum Phosphate-Montmorillonite Complex,
W79-02436 2G

WEBSTER, D.
Underground Injection Control Program Studied,
W79-02184 5G

WEINER, S. A.
Hazardous Material Spills: A Documentation and Analysis of Historical Data,
W79-02411 5G

WEIS, F. G.
Method and Apparatus for Removing Grit,
W79-02305 5D

WEISBERG, E.
Assessment of Hazardous Waste Practices in the Petroleum Refining Industry,
W79-02440 5D

WERNER, D.
Differential Elimination of Phenol by Diatoms and Other Unicellular Algae from Low Concentrations,
W79-02486 5C

WEST, A. B.
Intertidal Environment of Northern Dublin Bay,
W79-02204 5B

WHARTON, C. H.
Forested Wetlands of Florida-Their Management and Use,
W79-02112 6B

WHINSTON, A. B.
Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

WHITE, R. W. G.
Studies of the Ecology of Fish Populations in the Rye Meads Sewage Effluent Lagoons,
W79-02454 5C

WHITESIDE, E. P.
Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands: Soil Relationships,
W79-02429 6G

WICHERS, D. L.
Telemetric Determination of Salmonid Winter Micro-Habitat Occupation and Movement in Ice-Covered Streams,
W79-02157 7B

WILLIAMS, G.
Vegetation Changes in a Small Michigan Bog from 1917 to 1972,
W79-02091 2H

WILLIAMS, L. R.
Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

WILLIAMS, W. P.
The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

Studies of the Ecology of Fish Populations in the Rye Meads Sewage Effluent Lagoons,
W79-02454 5C

WILLIAMSON, G. D.
P-32 Uptake in Lentic Algae,
W79-02078 5C

WILLIS, C. E.
A Non-Linear Programming Approach to Floodplain Management with Non-Structural Alternatives,
W79-02400 6F

WILLIS, W. O.
Growth and Yield of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02035 3F

Plant Water Relationships of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02043 3F

WILMOTH, R. C.
Combination Limestone-Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02150 5D

Limestone and Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02302 5D

WINDOM, H. L.
Ability of Salt Marshes to Remove Nutrients and Heavy Metals from Dredged Material Disposa Area Effluents,
W79-02347 5E

WIRTZ, K. O.
Ethylmercury: Formation in Plant Tissues and Relation to Methylmercury Formation,
W79-02488 5A

WISE, R. H.
Partial Characterization of Chlorinated Organics in Superchlorinated Septages and Mixed Sludges,
W79-02413 5D

WITHERS, R. G.
Soft-Shore Macrobenthos Along the South-West Coast of Wales,
W79-02240 5C

WITTE, J. G.
The Limited Applicability of Marshallian Economics to the Problem of Pollution Abatement: A Suggested Alternative,
W79-02041 5G

WOLLER, D. M.
Public Groundwater Supplies in Kane County,
W79-02075 4B

WONG, A.
Toxicity, BOD, and Color of Effluents from Novel Bleaching Processes,
W79-02374 5C

WOO, M. K.
Analysis of Error in the Determination of Snow Storage for Small High Arctic Basins,
W79-02197 2C

WOOD, C. R.
Geology and Groundwater Resources of Northern Berks County, Pennsylvania,
W79-02132 2F

WOSTRADOWSKI, R.
Toxicity, BOD, and Color of Effluents from Novel Bleaching Processes,
W79-02374 5C

WRIGHT, D. A.
Gravitational Separator for Mixtures of Immiscible Liquids of Different Densities,
W79-02336 5D

YAKUNIN, A. S.
Instruments for Monitoring the Quality of Natural and Waste Waters,
W79-02214 5A

YEROMENKO, V. YA.
Study of River Meandering in the Search for Tectonic Structures (As Exemplified by the Middle Dniester Region),
W79-02205 8E

YOUGER, J. D.
Limnology of Selected Lakes in Ohio - 1975,
W79-02126 2H

ZAL'TSBERG, E. A.
Long-Period Ground-Water Regime in the Excessively Wet Zone of the European USSR,
W79-02212 2F

Role of Ground Waters in the Formation of the Total Runoff of a Small Drainage Basin in the Forest Zone,
W79-02211 4B

ZELLNER, A.
Mathematical Models of a Fishery,
W79-02069 6B

ZHMAYEVA, G. P.
Computation of Soil Freezing Depth in the Zone of Aeration,
W79-02215 2C

ZYUZYUN, V. E.
Purification of Effluents of the Verkhotursk Wood Chemical Plant in Storage Ponds (Ochistka stochnykh vod Verkhoturskogo Lesokhimicheskogo Zavoda v prudu-nakopitele),
W79-02372 5D

ORGANIZATIONAL INDEX

ABERDEEN UNIV. (SCOTLAND). DEPT. OF GEOGRAPHY.
Quantification, Decision-Making and Environmental Impact Assessment in the United Kingdom.
W79-02028 6G

AGRICULTURAL RESEARCH SERVICE, DURANT, OK. WATER QUALITY MANAGEMENT LAB.
Residual Forms of Fertilizer Nitrogen in Field Soils,
W79-02364 2K

AGRICULTURAL RESEARCH SERVICE, FORT LAUDERDALE, FL. SOUTHERN REGION.
The Autecology of Sawgrass in the Florida Everglades,
W79-02104 2L

AGRICULTURAL RESEARCH SERVICE, KIMBERLY ID. SNAKE RIVER CONSERVATION RESEARCH CENTER.
Controlling Sediment in Surface Runoff,
W79-02097 3F

AGRICULTURAL RESEARCH SERVICE, MANDAN, ND. NORTHERN GREAT PLAINS RESEARCH CENTER.
Growth and Yield of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02035 3F

Plant Water Relationships of Spring Wheat as Influenced by Shelter and Soil Water,
W79-02043 3F

AKADEMIYA NAUK SSSR, MOSCOW. INST. GEOGRAFII.
Complex Relations Between the Hydrologic Budget of the Major Geographic Zones of the Earth,
W79-02208 2A

AKADEMIYA NAUK SSSR, MOSCOW. INST. OF GEOGRAFII.
Geographic Aspects of the Territorial Redistribution of Water Resources,
W79-02209 4A

ALASKA DEPT. OF COMMUNITY AND REGIONAL AFFAIRS, JUNEAU. DIV. OF COMMUNITY PLANNING.
Planning for Offshore Oil Development. Gulf of Alaska OCS Handbook,
W79-02198 5G

ARGONNE NATIONAL LAB., IL. RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIV.
Chemical Characterization of Local and Stratospheric Plutonium in Ohio Soils,
W79-02320 5A

ARIZONA GAME AND FISH DEPT., PHOENIX; AND GEOLOGICAL SURVEY, TUCSON, AZ. WATER RESOURCES DIV.
Drainage Map of Arizona Showing Perennial Streams and Some Important Wetlands,
W79-02121 7C

ARIZONA UNIV., TUCSON.
General Equilibrium with a Replenishable Natural Resource,
W79-02068 6B

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Flotation of Fresh Water on Sea Water, A Historical Note,
W79-02171 2F

ARIZONA UNIV., TUCSON. ENVIRONMENTAL RESEARCH LAB.
Possible Toxic Effects of the Marine Blue-Green Alga, Spirulina Subsalsa, on the Blue Shrimp, Penaeus Stylirostris,
W79-02459 5C

ARIZONA UNIV., TUCSON. OFFICE OF ARID LANDS STUDIES.
Design and the Desert Environment: Landscape Architecture in the American Southwest,
W79-02339 3B

ARIZONA UNIV., TUCSON. SCHOOL OF RENEWABLE NATURAL RESOURCES.
Water Quality of Streamflow from Forested Watersheds on Sedimentary Soils,
W79-02404 5B

ARMY ENGINEER DISTRICT, LOS ANGELES, CA.
Liquefaction Potential of Hydraulic Fills,
W79-02203 8D

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS.
Perimeter Dike Kaising with Dewatered Fine-Grained Dredged Material at Upper Polecat Bay Disposal Area, Mobile, Alabama,
W79-02345 5E

Aquatic Disposal Field Investigations Duwamish Waterway Disposal Site Puget Sound, Washington, Evaluative Summary,
W79-02350 5C

Practical Riprap Design,
W79-02351 8B

Bay Springs Canal Surge Study, Tennessee-Tombigbee Waterway, Mississippi and Alabama; Hydraulic Model Investigation,
W79-02352 8B

Physical Model Simulation of the Hydraulics of Masonboro Inlet, North Carolina,
W79-02353 8B

Shoaling Conditions in Sawyer Bend and Lower Entrance to Chain of Rocks Canal, Mississippi River; Hydraulic Model Investigation,
W79-02354 8B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. LOWER MISSISSIPPI VALLEY DIV.
Control of 1973 Mississippi River Flood,
W79-02195 4A

ARRINGTON CO., INC., MUSKEGO, WI. (ASSIGNEE.
Waste Fluid Treatment System,
W79-02343 5D

ATOMICS INTERNATIONAL DIV., RICHLAND, WA. ROCKWELL HANFORD OPERATIONS.
A Statistical Evaluation of Some Columbia River Basalt Chemical Analysis,
W79-02433 5A

AUBURN UNIV., AL. DEPT. OF BIOLOGY; AND AUBURN UNIV., AL. DEPT. OF MICROBIOLOGY.
Effects of an Organic Arsenical Herbicide on a Salt Marsh Ecosystem,
W79-02427 5C

AUSTRALIAN NATIONAL UNIV., CANBERRA. RESEARCH SCHOOL OF SOCIAL SCIENCES.
An Analysis of Network Costs: A Study of Sydney's Water Supply from 1890 to 2001, Part I: Research Methods,
W79-02033 6B

BERGEN UNIV. (NORWAY). INST. OF ECONOMICS.
A Note on the Welfare-Economic Consequences of Extended Fishing Limits,
W79-02047 6E

BIOLOGISCHE BUNDESANSTALT FUER LAND- UND FORSTWIRTSCHAFT, BERLIN (WEST GERMANY). INST. FUER NICHTPARASITARE PFLANZENKRANKHEITEN.
Effect of Hexachlorobenzene (HCB) on Photosynthetic Oxygen Evolution and Respiration of Chlorella Pyrenoidosa,
W79-02480 5C

BIRMINGHAM UNIV. (ENGLAND). HYDROGEOLOGY SECTION.
Fossil Ground-Water Gradients in Arid Regional Sedimentary Basins,
W79-02189 2F

BLACK AND VEATCH, DALLAS, TX.
Financing System Changes,
W79-02023 6C

BRITISH COLUMBIA UNIV., VANCOUVER. FACULTY OF COMMERCE AND BUSINESS ADMINISTRATION.
The Effects of Some Basic Statistical and Biological Principles on Water Pollution Control,
W79-02498 5G

BRUSSELS UNIV. (BELGIUM). LAB. D'ENVIRONNEMENT.
A Budget of Nitrogen Recycling in North Sea Sediments off the Belgian Coast,
W79-02245 5C

BUNDESFORSCHUNGSANSTALT FUER FISCHEREI, HAMBURG (WEST GERMANY). INST. FUER KUESTEN- UND BINNENFISCHEREI.
Uptake, Retention and Loss of Cadmium by Brown Shrimp, (Crangon Crangon),
W79-02463 5B

BUNDESFORSCHUNGSANSTALT FUER FISCHEREI, HAMBURG (WEST GERMANY). ISOTOPENLABORATORIUM.
Further Data on Heavy Metals and Organochlorines in Marine Mammals from German Coastal Waters,
W79-02460 5B

CAF INDUSTRIES, PHOENIX, AZ. (ASIGNEE).
Fresh Water Supply and Waste Water Retention System,
W79-02317 5G

CALIFORNIA DEPT. OF WATER RESOURCES, SACRAMENTO.
The Occurrence and Removal of Nitrogen in Subsurface Agricultural Drainage from the San Joaquin Valley, California,
W79-02107 5G

Ground Water...California's Priceless Resource,
W79-02392 4B

CALIFORNIA DEPT. OF WATER RESOURCES, SACRAMENTO.

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Mass Balance Determinations for Pollutants in Urban Regions. Methodology with Applications to Lead, Zinc, Cadmium, and Arsenic.
W79-02148 5A

CALIFORNIA UNIV., BERKELEY. DEPT. OF BIOLOGY.
Reduction of Nitrate in a Soil Column During Continuous Flow,
W79-02366 2G

CALIFORNIA UNIV., BERKELEY. DEPT. OF SOILS AND PLANT NUTRITION.
Disappearance of Nitrate Under Transient Conditions in Columns of Soil,
W79-02122 2G

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Trophic Structure Modifications by Planktivorous Fish in Aquatic Microcosms,
W79-02013 5C

A Pattern Analysis of Clear Lake Phytoplankton,
W79-02227 5C

CALIFORNIA UNIV., DAVIS.
Factors Influencing Usefulness of Antitranspirants Applied on Phreatophytes to Increase Water Supplies,
W79-02291 3B

CALIFORNIA UNIV., DAVIS. DEPT. OF AGRONOMY AND RANGE SCIENCE.
Land Use and Intensive Range Management in the Sierra Nevada Foothills--A Contemporary Analysis,
W79-02293 4D

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF BIOLOGY.
The Uptake, Retention, and Release of Ammonium by Reef Corals,
W79-02228 5C

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF CHEMICAL, NUCLEAR AND THERMAL ENGINEERING.
Adsorption of Poliovirus Type I to Wastewater Treatment Plant Solids,
W79-02446 5D

Virus Transport Through Solid Beds,
W79-02447 5B

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF ECONOMICS.
Coordinating Public Utility Expansion, Industrial Siting and Pollution Control: A Working Dynamic Programming Algorithm,
W79-02039 5G

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF BIOLOGICAL SCIENCES.
Role of Inorganic Ions in Controlling Sedimentation Rate of a Marine Centric Diatom Ditylum Brightwelli,
W79-02014 5C

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF ECONOMICS.
Measurement of Economic Uncertainty in Public Water Resource Development: An Extension,
W79-02050 6B

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Hydraulic Model Tests of the Proposed Weir for the Richelieu River at St. Jean, Quebec,
W79-02414 8C

CANPLAN FILTRATION LTD., HALIFAX (NOVA SCOTIA).
Filration System,
W79-02332 5D

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT, WEST PALM BEACH, FL.
The Organic Sediments of Corkscrew Swamp Sanctuary,
W79-02284 2H

CENTRO TEORIA DEI SISTEMI, MILAN (ITALY).
Stable Taxation Schemes in Regional Environmental Management,
W79-02051 5G

CHELSEA COLL., LONDON (ENGLAND). DEPT. OF PHARMACOLOGY; AND CHELSEA COLL., LONDON (ENGLAND). DEPT. OF ZOOLOGY.
Some Histopathological Effects of Aroclor 1254 on the Liver and Gonads of Rainbow Trout, Salmo Gairdneri, and Carp, Cyprinus Carpio,
W79-02452 5C

Studies of the Ecology of Fish Populations in the Rye Meads Sewage Effluent Lagoons,
W79-02454 5C

CHELSEA COLL., LONDON (ENGLAND). DEPT. OF ZOOLOGY; AND CHELSEA COLL., LONDON (ENGLAND). DEPT. OF PHARMACOLOGY.
The Effects of Polychlorinated Biphenyls on Plasma Steroid Levels and Hepatic Microsomal Enzymes in Fish,
W79-02453 5C

CHEMED CORP., CINCINNATI, OH. (ASSIGNEE).
Polyquaternary Compounds for the Control of Microbiological Growth,
W79-02331 5D

CHEMIEFASER LENZING A. G., LENZING (AUSTRIA).
Possibilities for Reducing COD and 5-Day BOD in Waste Waters from the Pulp and Viscose Rayon Fiber Industries (Moeglichkeiten zur Reduktion des CSB und BSB(5) in den Abwaessern der Zellstoff- und Viskosefaserindustrie),
W79-02376 5D

CHICAGO UNIV., IL.
A Polluted Golden Age,
W79-02071 5G

CIBA-GEIGY CORP., ARDSLEY, NY. (ASSIGNEE).
Novel Compositions of Matter for Use in the Treatment of Aqueous Systems,
W79-02335 5F

COAST GUARD RESEARCH AND DEVELOPMENT CENTER, GROTON, CT.
Physical Properties of Icebergs, Part I--Height to Draft Ratios of Icebergs, Part II--Mass Estimation of Arctic Icebergs,
W79-02216 2C

COLLEGE OF WILLIAM AND MARY, WILLIAMSBURG, VA. DEPT. OF MARINE SCIENCES.
The Effects of Petroleum on the Salt Marsh Ecosystem,
W79-02485 5C

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF AGRICULTURAL AND CHEMICAL ENGINEERING.
A Systematic Procedure for Taxing Agricultural Pollution Sources,
W79-02219 5G

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Development of a Stream-Aquifer Model Suited for Management,
W79-02450 4B

COLORADO UNIV., BOULDER. DEPT. OF CIVIL, ENVIRONMENTAL, AND ARCHITECTURAL ENGINEERING.
Pollutional Characteristics of Stormwater Runoff,
W79-02451 5B

COMBUSTION ENGINEERING INC., BRANTFORD (ONTARIO). C-E BAUER DIV.
Screening -- A Novel Approach to Primary Treatment,
W79-02363 5D

CONNECTICUT COLL., NEW LONDON. DEPT. OF BOTANY.
Biochemical and Transpiration Studies of the Growth Form of Spartina Alterniflora on Connecticut Salt Marshes,
W79-02101 2I

CONNECTICUT COLL., NEW LONDON. DEPT. OF ECONOMICS.
'The Relationship Between Firm and Fishery in Common Property Fisheries': Comment,
W79-02060 6B

CORNELL UNIV. AGRICULTURAL EXPERIMENT STATION, ITHACA, NY. DEPT. OF AGRICULTURAL ECONOMICS.
Studying the Economics of a Waterway: A Critique of Studies of the McClellan-Kerr Arkansas River Navigation System,
W79-02052 6B

Is It Time to Do a Benefit-Cost Analysis for the Location of a Power Plant,
W79-02054 6B

CORNELL UNIV., ITHACA, NY. DEPT. OF AGRICULTURAL ENGINEERING.
Issues in Water Development Decisions: A Discussion Paper,
W79-02042 6B

CORNELL UNIV., ITHACA, NY. DEPT. OF ENGINEERING; AND CORNELL UNIV., ITHACA, NY. DEPT. OF APPLIED PHYSICS.
Land Subsidence Due to Water Withdrawal in the Vicinity of Pecos, Texas,
W79-02396 4B

CORVALLIS ENVIRONMENTAL RESEARCH LAB., OR.
A Survey of Phosphorus and Nitrogen Levels in Treated Municipal Wastewater,
W79-02003 5A

DALHOUSIE UNIV., HALIFAX (NOVA SOCTIA). DEPT. OF BIOLOGY.
Effects of Nitrate Concentration on the Growth and Physiology of Lominaria Saccharina (Phaeophyta) in Culture,
W79-02010 5C

DANMARKS FISHKERI- OG HAVUNDERSOGELSER, CHARLOTTENLUND.
A Model of the Biological Effects of Eutrophication in the North Sea,
W79-02469 5C

A Method of Predicting the Biological Effects of Synthetic Pollutants in the North Sea,
W79-02470 5C

DELAWARE GEOLOGICAL SURVEY, NEWARK.
Subsurface Geological Investigation of a Pleistocene Braided Stream in the Northern Coastal Plain, Delaware (U.S.A.),
W79-02167 2J

DELAWARE UNIV., LEWES. MARINE STUDIES COMPLEX.
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W79-02223 5C

DELAWARE UNIV., NEWARK. DEPT. OF BIOLOGICAL SCIENCES.
The Characterization of Bacillus Capable of Blue-Green Bactericidal Activity,
W79-02159 5D

DELAWARE UNIV., NEWARK. DEPT. OF CHEMICAL ENGINEERING.
Involvement of Free Radicals in the Aqueous-Phase Catalytic Oxidation of Phenol Over Copper Oxide,
W79-02166 5D

DELAWARE UNIV., NEWARK. DEPT. OF ECONOMICS.
'The Relationship Between Firm and Fishery in Common Property Fisheries': Reply,
W79-02061 6B

DELHI UNIV. (INDIA). DEPT. OF ZOOLOGY.
Thermal Tolerance and Preference of the Indian Catfish Heteropneustes Fossilis,
W79-02455 5C

DEPARTMENT OF AGRICULTURE, OTTAWA (ONTARIO). SOIL RESEARCH INST.
Effects of Temperature and Time on Hydroxy Aluminum Phosphate-Montmorillonite Complex,
W79-02436 2G

DEPARTMENT OF AGRICULTURE, WASHINGTON, DC. OFFICE OF THE SECRETARY. (ASSIGNEE).
Process for Recovering Proteinaceous Matter from Acid Whey and Tannery Unhairing Effluents,
W79-02334 5D

DESERT INST. ASHKHABAD (USSR).
Remote Sensing Techniques and the Monitoring of Desertification Processes in Arid Areas,
W79-02390 7B

DOW CHEMICAL CO., MIDLAND, MI. (ASSIGNEE).
Device for Measuring pH and Temperature of a Liquid, Which Includes a Memory,
W79-02316 5A

DOW CHEMICAL CO., MIDLAND, MI. ENVIRONMENTAL SCIENCE RESEARCH LAB.
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W79-02017 5C

DUKE UNIV., DURHAM, NC. DEPT. OF BOTANY.
Root Production and Root Turnover in a Wet Tundra Ecosystem, Barrow, Alaska,
W79-02100 2I

EAST BAY MUNICIPAL UTILITY DISTRICT, OAKLAND, CA.
The Economics of Water Conservation,
W79-02022 3D

ECODYNE CORP., LINCOLNSHIRE, IL. (ASSIGNEE).
Method and Apparatus for Removing Grit,
W79-02305 5D

EIDGENOESSISCHE ANSTALT FUER WASERVERSORGUNG, ABWASSERRINIGUNG UND GEWAESSERSCHUTZ, ZURICH (SWITZERLAND).
A Dynamic Lake Model for Trophic State Prediction,
W79-02006 5C

ENVIREX, INC., MILWAUKEE, WI. ENVIRONMENTAL SCIENCES DIV.
Handling and Disposal of Sludges from Combined Sewer Overflow Treatment. Phase II - Impact Assessment,
W79-02303 5D

ENVIRONMENTAL DEVICES CORP., MARION, MA. (ASSIGNEE).
Scanning Apparatus for Septic Effluents,
W79-02340 5D

ENVIRONMENTAL MONITORING AND SUPPORT LAB., CINCINNATI, OH.
Comparison of Methods for the Determination of Total Available Residual Chlorine in Various Sample Matrices,
W79-02412 5A

ENVIRONMENTAL MONITORING AND SUPPORT LAB., LAS VEGAS, NV.
Prediction of Phytoplankton Productivity in Lakes,
W79-02055 5C

Ethylmercury: Formation in Plant Tissues and Relation to Methylmercury Formation,
W79-02488 5A

ENVIRONMENTAL MONITORING AND SUPPORT LAB., LAS VEGAS, NV. MONITORING SYSTEMS RESEARCH AND DEVELOPMENT DIV.
Volatility of Mercury from Soils Amended with Various Mercury Compounds,
W79-02142 5B

Macroinvertebrate Sampling Techniques For Streams in Semi-Arid Regions: Comparison of the Surber Method and A Unit-Effort Traveling Kick Method,
W79-02146 5A

ENVIRONMENTAL PROTECTION AGENCY, COLLEGE, AK. ALASKA WATER LAB.
Research on Control Technology for Ice Fog From Mobile Sources,
W79-02147 5G

ENVIRONMENTAL PROTECTION AGENCY, RIVESVILLE, WV. RESOURCE EXTRACTION AND HANDLING DIV.
Limestone and Lime Neutralization of Ferrous Iron Acid Mine Drainage,
W79-02302 5D

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC.
EPA's Construction Grants Program: Perspectives Costs,
W79-02027 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC. OFFICE OF RESEARCH AND DEVELOPMENT.
Advances in Storm and Combined Sewer Pollution Control Abatement Technology,
W79-02437 5D

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Hazardous Waste Disposal Damage Reports, Document No 2.
W79-02443 5E

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC. OFFICE OF WATER AND HAZARDOUS MATERIALS.
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W79-02233 5G

ENVIRONMENTAL RESEARCH LAB., GULF BREEZE, FL.
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W79-02484 5C

EPICOR, INC., LINDEN, NJ. (ASSIGNEE).
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W79-02307 5D

EVANS-HAMILTON, INC., SEATTLE, WA.
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W79-02221 2L

EXXON CO., HOUSTON, TX.
Improved Techniques for Evaluating Carbonate Waterfloods in West Texas,
W79-02182 4B

FACTORY MUTUAL RESEARCH CORP., NORWOOD, MA.
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W79-02411 5G

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, DENVER, CO. SOUTH PLATTE RIVER BASIN PROJECT.
Disaster Response to Flash Flood,
W79-02193 8B

FISH AND WILDLIFE SERVICE, JAMESTOWN, ND. NORTHERN PRAIRIE WILDLIFE RESEARCH CENTER.
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W79-02418 2I

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Effects of Burial on the Heart Cockle Clinocardium Nuttallii and the Dungeness Crab Cancer Magister,
W79-02472 5C

FLORIDA UNIV., GAINESVILLE. CENTER FOR WETLANDS.
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W79-02256 2I

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W79-02285 5B

The Projected Cost of Cypress Wetland Disposal for Waldo, Florida,
W79-02286 5E

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W79-02283 2I

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Progress Repot on Mosquitoe Research: Cypress Domes,
W79-02281 5G

FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONEMENTAL ENGINEERING SCIENCES; AND FLORIDA UNIV., GAINESVILLE. CENTER FOR WETLANDS.

Comparative Studies of Cypress Ecosystems,
W79-02277 2H

FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONMENTAL ENGINEERING SCIENCE; AND FLORIDA UNIV., GAINESVILLE. CENTER FOR WETLANDS.

Air Emissions from Cypress Swamps,
W79-02266 5C

FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONMENTAL ENGINEERING SCIENCES.

Coliform Monitoring of Waters Associated with the Cypress Dome Project,
W79-02268 5C

FLORIDA UNIV., GAINESVILLE. DEPT. OF ENVIRONMENTAL ENGINEERING SCIENCES; AND FLORIDA UNIV., GAINESVILLE. CENTER FOR WETLANDS.

Radiation Studies: Cypress Wetlands,
W79-02261 2I

The Response of Benthic Invertebrate Populations to Sewage Addition,
W79-02267 5C

Distribution of Chlorophyll in Cypress Ecosystems,
W79-02278 2I

The Effects of Perturbation on Cypress Dome Animal Communities,
W79-02279 5C

Cypress Growth Response in a Sewage-Enriched Pond Cypress Ecosystem,
W79-02287 5C

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W79-02270 5C

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W79-02269 5C

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Hydrology of the Austin Cary Control Dome,
W79-02260 5E

FLORIDA UNIV., GAINESVILLE. DEPT. OF SOIL SCIENCE.

Sedimentation Rates: Cypress Domes,
W79-02275 5C

Nitrogen Transformations in Water and Sediments of Cypress Domes with and without Added Sewage Effluent,
W79-02276 2H

FLORIDA UNIV., GAINESVILLE. SCHOOL OF FOREST RESOURCES AND CONSERVATION.

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W79-02271 5C

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Seasonal Changes in the Distribution of Water Fern and Duckweed in Cypress Domes Receiving Sewage,
W79-02262 2I

Changes in Understory Vegetation in Cypress Domes Brought About by Fire and Addition of Sewage,
W79-02263 5C

Uptake and Distribution of Phosphorus in the Understory of Cypress Domes,
W79-02264 5C

Litterfall and Litter Decomposition in Four Cypress Domes,
W79-02265 2I

Growth Rates of Seedlings Planted in Cypress Domes,
W79-02272 5C

Effect of Sewage Effluent in Cypress Ponds on Surrounding Soil Moisture and Nutrient Content and on Growth of Pine Trees (Summary of MS Thesis),
W79-02273 5C

Effect of Sewage Effluent in Cypress Ponds on Growth of Surrounding Pine Seedlings and Trees,
W79-02274 5C

Comparison of Fall Birds Present in a Natural Cypress Dome, and the Adjacent Pine Plantation,
W79-02280 5C

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Hydrology and Water Budgets of Cypress Domes,
W79-02257 5B

Hydrologic Budget Model,
W79-02258 2H

FLORIDA UNIVERSITY, GAINESVILLE, DEPARTMENT OF GEOLOGY.

Stratigraphy and Hydrogeologic Correlation Studies in Several Cypress Domes-North Central Florida,
W79-02259 5E

FOREST SERVICE (USDA), DURHAM, NH.

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W79-02448 4D

FOREST SERVICE (USDA), ST. PAUL MN. NORTH CENTRAL FOREST EXPERIMENT STATION.

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W79-02421 4C

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W79-02005 5C

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W79-02234 5C

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W79-02297 5D

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W79-02458 5C

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Aquatic Plant Management in Semi-Natural Streams: The Role of Marginal Vegetation,
W79-02012 5G

GEOLOGICAL SURVEY, ALBANY, NY.

Apparent Use of Sediment Nitrogen and Phorphorus by Plants in Malletts Creek Marsh with Implications to Lake Champlain Water Level Regulation,
W79-02115 2H

GEOLOGICAL SURVEY, ALBANY, NY. WATER RESOURCES DIV.

A Contribution to the Lake Pleistocene Stratigraphy of the Susquehanna River Valley of New York,
W79-02135 2J

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Comparison of the Predictive Accuracy of Models of Urban Flow and Water-Quality Processes,
W79-02253 5B

GEOLOGICAL SURVEY, COLUMBUS, OH., WATER RESOURCES DIV.

Limnology of Selected Lakes in Ohio - 1975,
W79-02126 2H

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W79-02295 5C

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W79-02141 7C

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W79-02133 7C

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W79-02132 2F

GEOLOGICAL SURVEY, HONOLULU, HI. WATER RESOURCES DIV.
Flow Characteristics of Streams in Tutuila, American Samoa,
W79-02124 2E

GEOLOGICAL SURVEY, HURON, SD. WATER RESOURCES DIV.
Major Aquifers in Clark County, South Dakota,
W79-02134 2F

GEOLOGICAL SURVEY, LAGUNA NIGUEL, CA.
Model Aids Planners in Predicting Rising Ground-Water Levels in San Bernadino, California,
W79-02173 4B

GEOLOGICAL SURVEY, LAWRENCE, KS. WATER RESOURCES DIV.
Gradient, Discharge, and Particle-Size Relations of Alluvial Channels in Kansas, With Observations on Braiding,
W79-02120 2J

GEOLOGICAL SURVEY, MENLO PARK, CA. WATER RESOURCES DIV.
Sedimentation in Hot Creek in Vicinity of Hot Creek Fish Hatchery, Mono County, California,
W79-02128 2J

Origins of Water and Solutes in the Geopressured Zones of the Northern Gulf of Mexico Basin,
W79-02131 2K

Simulation Model of Cryptomonas Ovata Population Dynamics in Southern Kootenay Lake, British Columbia,
W79-02225 5C

GEOLOGICAL SURVEY, MENLO PARK, CA., WATER RESOURCES DIV., AND GEOLOGICAL SURVEY, MENLO PARK CA., GEOLOGIC DIV.
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W79-02130 2F

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W79-02254 2F

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W79-02123 10D

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Economic Impact of Alternative Stormwater Drainage Systems,
W79-02289 5D

PURDUE UNIV., LAFAYETTE, IN. DEPT. OF AGRONOMY.
Material Content of Binary Physical Mixture as Measured with a Dual-Energy Beam of Gamma Rays,
W79-02356 2G

Water Infiltration into Uniform and Stratified Soils I. Review and Use of an Approximate Theory,
W79-02492 2G

Water Infiltration into Uniform and Stratified Soils II. Experimental Evaluation of an Approximate Theory,
W79-02493 2G

PURDUE UNIV., LAFAYETTE, IN. DEPT. OF CHEMISTRY.
Supercooling of Water to -92 Degrees C Under Pressure,
W79-02494 2C

PURDUE UNIV., LAFAYETTE, IN. WATER RESOURCES RESEARCH CENTER.
Streaming-Potential Effects in Saturated Water Flow Through a Sand-Kaolinite Mixture,
W79-02160 2G

Electrical Potentials During Water Entry into an Air-Dry Mixture of Sand and Kaolinite,
W79-02357 2G

PURDUE UNIVERSITY WEST LAFAYETTE, INDIANA. DEPARTMENT OF GEOSCIENCES.
Subsurface Stratigraphy and Water Resources of Cass County, Indiana,
W79-02185 4B

QUEEN'S UNIV., KINGSTON (ONTARIO). DEPT. OF CHEMICAL ENGINEERING.
Nitrate Reduction by Denitrifying Bacteria in Single and Two Stage Continuous Flow Reactors,
W79-02406 5D

RENSSELAER POLYTECHNIC INST. TROY, NY. DEPT. OF BIOLOGY.
Maximum Depth Inhabited by Aquatic Vascular Plants,
W79-02249 5C

RESOURCES FOR THE FUTURE, INC., WASHINGTON, DC. QUALITY OF THE ENVIRONMENT PROGRAM.
Measuring Natural Resources Scarcity: Theory and Practice,
W79-02059 6B

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Systematic Absorbance Errors with Technicon AutoAnalyzer II Colorimeters,
W79-02074 2K

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION, FORT COLLINS, CO.
Range Cattle Impacts on Stream Water Quality in the Colorado Front Range,
W79-02386 5G

ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE, MIAMI, FL.
The Distribution and Form of Phosphorus in North Atlantic Ocean Deep-Sea and Continental Slope Sediments,
W79-02230 5B

ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE, MIAMI, FL. DIV. OF BIOLOGY AND LIVING RESOURCES.
Growth-Influencing Substances in Sediment Extracts from a Subtropical Wetland: Investigation Using a Diatom Bioassay,
W79-02476 5C

ROYAL DANISH SCHOOL OF PHARMACY, COPENHAGEN.
Examination of a Lake Model,
W79-02007 5C

RUTGERS - THE STATE UNIV., NEW BRUNSWICK. DEPT. OF ZOOLOGY.
Storm Derived Losses of Phosphorus and their Significance to Annual Phosphorus Export from Two New Jersey Watersheds,
W79-02151 5B

The Effects of Storm Events on the Annual Phosphorus Transport in Six-Mile Run,
W79-02153 5B

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF ENVIRONMENTAL SCIENCE.
Significance of Nitrification in Stream Analysis-Effects on the Oxygen Balance,
W79-02001 5C

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ. DEPT. OF SOILS AND CROPS.
Simulated Flow Through the Root Xylem,
W79-02199 2I

RUTGERS - THE STATE UNIV., NEWARK, NJ. DEPT. OF BOTANY.
Earthquake-Initiated Changes in the Nesting Habitat of the Dusky Canada Goose,
W79-02416 2I

SAURASHTA UNIV., RAJKOT (INDIA). DEPT. OF BIOSCIENCES.
Eco-Biochemical Studies on Some Economically Important Intertidal Algae from Port Okha (India),
W79-02475 5C

SCHRIEBER GMBH AND CO. KG, LANGENHAGEN (WEST GERMANY). (ASSIGNEE).
Drive Device for Rake Arm with Attached Screen Comb in Cleaning Device for a Water Conduit Screen,
W79-02306 8C

SCHULTES (A. C.) AND SONS, INC., WOODBURY, NJ.
Two Drilling Methods Compared,
W79-02169 8B

SHINETSU CHEMICAL CO., TOKYO (JAPAN). (ASSIGNEE).
Desalination Reverse Osmotic Membranes and Their Preparation,
W79-02338 3A

SOCIETE DEGREMONT PARIS (FRANCE). (ASSIGNEE).
Water Treatment Apparatus and Method,
W79-02333 5F

SOCIETE GENERALE DE CONSTRUCTIONS ELECTRIQUES ET MECANIQUES ALSTHOM, PARIS (FRANCE). (ASSIGNEE).
Device for the Removal of a Liquid Layer on Water,
W79-02337 5G

SOUTH AFRICAN BLOCK AND CONCRETE (PTY) LTD., ALBERTON. (ASSIGNEE).
Drainage Device for Particulate Material,
W79-02326 5D

SOUTH CAROLINA STATE COLL., ORANGEBURG. DEPT. OF NATURAL SCIENCES.
Determination of Methylmercury in Fish of South Carolina,
W79-02478 5A

SOUTH CAROLINA UNIV., COLUMBIA. DEPT. OF GEOLOGY.
Velocity Averaging in Estuaries Characterized by a Large Tidal Range to Depth Ratio,
W79-02355 2L

The Urquiola Oil Spill, La Coruna, Spain: Impact and Reaction on Beaches and Rocky Coasts,
W79-02500 5C

SOUTHERN FOREST EXPERIMENT STATION, OXFORD, MS. FOREST HYDROLOGY LAB.
Consequences of Site Disturbances in the Upper Coastal Plain,
W79-02431 4D

ST. MARY'S UNIV., HALIFAX (NOVA SCOTIA).
The Economic Consequences of the 200-Mile Seabed Zone: The Replenishable Resources Case,
W79-02048 6E

STATE UNIV. OF NEW YORK AT ALBANY DEPT. OF BIOLOGICAL SCIENCES.
Application of a Model of Zooplankton Composition to Problems of Fish Introductions to the Great Lakes,
W79-02020 5C

STATE UNIV. OF NEW YORK AT BINGHAMTON. SCHOOL OF MANAGEMENT.
Coefficients of Pollution: Interindustry Linkage and Pollution in Belgium,
W79-02031 5G

STATE UNIV. OF NEW YORK AT STONY BROOK. MARINE SCIENCES RESEARCH CENTER.
Distribution of Surficial Sediments and Eelgrass in New York's South Shore Bays: An Assessment from the Literature,
W79-02162 2L

Transportation and Accumulation of Fine-Grained Sediments in the Estuarine Environment: Recommendations for Research,
W79-02165 2L

STATE UNIV. OF NEW YORK COLL. AT BUFFALO. GREAT LAKES LAB.
Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix A: Planktonic Communities, Benthic Assemblages, and Fishery,
W79-02346 5E

STONE (RALPH) AND CO., INC., LOS ANGELES, CA.
Treatment Effectiveness for the Removal of Selected Contaminants from Drinking Water,
W79-02435 5F

SUN OIL CO., PHILADELPHIA, PA. (ASSIGNEE).
Liquid Level Control System for Separation Tank,
W79-02327 5D

SUSSEX UNIV., BRIGHTON (ENGLAND).
The Long-Run Movement of the Prices of Exhaustible Resources,
W79-02026 6C

SWEDISH WATER AND AIR POLLUTION RESEARCH LAB., GOTEBORG.
Atmospheric Formation, Dispersion, and Deposition of Acid Substances,
W79-02015 5A

SYAVSKII LESKOKHIMICHESKII ZAVOD (USSR).
Chemical Foam Control During Effluent Treatment in Aeration Tanks (Khimicheskoe penogashenie pri ochistke stochnykh vod v aerotenkakh),
W79-02382 5D

TACOMA DEPT. OF PUBLIC UTILITIES, WA. WATER DIV.
Innovative Water System Solves Quality Problem,
W79-02183 5G

TECHISCHE UNIV., DARMSTADT (WEST GERMANY). WASSER UND ABWASSERFORSCHUNGSSTELLE.
Status and Methods for Effluent Purification in Pulp and Paper Mills (Stand und Verfahren der Restabwasserreinigung von Zellstoff- und Papierfabriken),
W79-02377 5D

TECHNION-ISRAEL INST. OF TECH., HAIFA. FACULTY OF AGRICULTURAL ENGINEERING.
Application of the Electrical Double Layer Theory to Predict Ion Absorption in Mixed Ionic Systems,
W79-02314 2K

Wind, Sprinkler Patterns, and System Design,
W79-02368 3F

TECHNION - ISRAEL INST. OF TECH., HAIFA. SOILS AND FERTILIZERS LAB.
A Computer Simulation of Phosphate and Nitrogen Transport by Water Runoff,
W79-02251 5B

TECHNISCHE HOGESCHOOL TWENTE, ENSCHEDE (NETHERLANDS). DEPT. OF CHEMICAL ENGINEERING.
Wind Induced Dispersion and Algal Growth in Shallow Lakes,
W79-02226 5G

TECHNISCHE UNIV., DARMSTADT (WEST GERMANY). WASSER UND ABWASSERFORSCHUNGSTELLE.
Fish Test With Golden Orfe -- Testing the Toxicity of Matter Contained in Water (Fischtest mit Goldorfen -- Pruefung der Toxizitaet von Wasserinhaltsstoffen),
W79-02375 5C

TEL-AVIV UNIV. (ISRAEL). SCHOOL OF ENGINEERING.
A Note on Packer, Slug, and Recovery Tests in Unconfined Aquifers,
W79-02179 8G

TELEDYNE INDUSTRIES, INC., FORT COLLINS, CO. (ASSIGNEE).
Water Purifier,
W79-02308 5F

TENNESSEE STATE UNIV., NASHVILLE.
Field Persistence and Movement of Trifluralin in Two Soil Types,
W79-02417 2G

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF OCEANOGRAPHY.
Flume Experiments on Sand, Silt, and Clay Mixtures from the Offshore Dredged Material Disposal Site, Galveston, Texas,
W79-02348 5E

TEXAS A AND M UNIV., LUBBOCK. AGRICULTURAL RESEARCH AND EXTENSION CENTER.
Calculating the Cost of Each Irrigation,
W79-02094 3F

TEXAS TRANSPORTATION INST., COLLEGE STATION.
Profile and Measurement of Social Well-Being Indicators for Use in the Evaluation of Water and Related Land Management Planning,
W79-02344 6B

TEXAS UNIV. AT AUSTIN, PORT ARANSAS. PORT ARANSAS MARINE LAB.
Organism Patchiness in Lakes Resulting from the Interaction Between the Internal Seiche and Planktonic Diurnal Vertical Migration,
W79-02009 5C

TEXAS UNIV. AT PASO. DEPT. OF CIVIL ENGINEERING.
Treatment of High Strength Meatpacking Plant Wastewater by Land Application,
W79-02301 5D

TOKYO UNIV. (JAPAN). OCEAN RESEARCH INST.
Ammonium Oxidation and its Significance in the Summer Cycling of Nitrogen in Oxygen Depleted Skan Bay, Unalaska Islanda, Alaska,
W79-02004 5C

TORONTO UNIV. (ONTARIO). DEPT. OF BOTANY.
Water Level Fluctuation in a Northeastern Ontario Peatland,
W79-02105 2H

TRACER JITCO, INC., ROCKVILLE, MD.
Procedure for the Evaluation of Environmental Monitoring Laboratories,
W79-02149 5A

TRINITY COLL., DUBLIN (IRELAND). DEPT. OF BOTANY.
Intertidal Environment of Northern Dublin Bay,
W79-02204 5B

UNIVERSA OIL PRODUCTS, ST. PAUL, MN. JOHNSON DIV.
Drillers Find Increasing Use for Plastic Pipe,
W79-02177 8G

UNIVERSITY COLL., CARDIFF (WALES). DEPT. OF MICROBIOLOGY.
Microorganisms and Heavy metal Toxicity,
W79-02483 5C

UNIVERSITY COLL. OF SWANSEA (WALES). DEPT. OF ZOOLOGY.
Soft-Shore Macrobenthos Along the South-West Coast of Wales,
W79-02240 5C

UNIVERSITY OF SOUTH FLORIDA, TAMPA. DEPT. OF BIOLOGY.
The Vegetation of Southern Florida,
W79-02425 2I

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. DEPT. OF GEOLOGICAL SCIENCE.
Hypersaline Lagoonal Deposits and Processes,
W79-02430 2L

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. INST. FOR MARINE AND COASTAL STUDIES.
You Can Tailor Effluent BOD to Fit the Receiving-Water Ecosystem...and Enhance the Environment. Urban and Fish-Processing Wastes in the Marine Environment: Bioenhancement Studies at Terminal Island, California,
W79-02164 5E

UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG.
Dredge Spoil in Mississippi Sound,
W79-02188 5E

UNIVERSITY OF WESTERN ONTARIO, LONDON.
Exploitation of Common-Property Replenishable Natural Resources,
W79-02070 6B

UTAH STATE UNIV., LOGAN.
Consumer Surplus and Economic Rent Estimates of Recreation Value: An Empirical and Theoretical Comparison,
W79-02290 6B

UTAH STATE UNIV., LOGAN. COLL. OF ENGINEERING.
Manpower Utilization and Future Needs of Manufacturing Industries in Water Pollution Control,
W79-02438 5G

UTAH STATE UNIV., LOGAN. ECOLOGY CENTER.
Model for Decomposition of Organic Material by Microorganisms,
W79-02415 2G

UTAH STATE UNIV., LOGAN. INST. FOR LAND REHABILITATION.
Establishment of Native Plants for the Rehabilitation of Paraho Processed Oil Shale in an Arid Environment,
W79-02391 4A

UTAH UNIV., SALT LAKE CITY. COLL. OF ENGINEERING.
Analysis of the Environmental Control Technology for Oil Shale Development,
W79-02432 5G

UTAH WATER RESEARCH LAB., LOGAN.
Management of Rural Water Supply Peak Flow Rates,
W79-02194 3D

Stochastic Modeling for Predicting Frequency Distribution of Stages in Thermal Lakes at Future Planning Horizons,
W79-02495 4A

VALMET OY, JYVASKYLA (FINLAND).
Analyses of Paper Machine Waters with Ion Specific Electrodes. Part V. Sulfide Determination Using Ag(+) Ion Specific Electrode and Various Measurement Methods,
W79-02388 5A

VANDKVALITETSINSTITUTET, HOERSHOLM (DENMARK).
Fish Farms are Having to Watch Their Waste.
W79-02474 5G

VERMONT DEPT. OF FISH AND GAME, MONTPELIER.
The Productivity of Lake Champlain wit Regard to Waterfowl, Furbearers, and Other Wildlife,
W79-02114 2H

VICTORIA UNIV. OF MANCHESTER (ENGLAND).
On the Optimal Policy for Exploiting Renewable Resource Stocks,
W79-02040 6B

VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT, VA.
Angiosperm Production of Three Virginia Marshes in Various Salinity and Soil Nutrient Regimes,
W79-02108 2L

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF FISHERIES AND WILDLIFE SCIENCES.
Computer Assisted Instruction in Natural Resource Management,
W79-02161 7C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. VA. DEPT. OF AGRICULTURAL ECONOMICS.
An Economic Approach to Water Supply Planning in Southeastern Virginia,
W79-02294 6B

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., HAMPTON. DEPT. OF FOOD SCIENCE AND TECHNOLOGY.
Proceedings of the Interstate Seafood Seminar October 4-7, 1977.
W79-02163 5G

VIRGINIA UNIV., CHARLOTTESVILLE. DEPT. OF ENVIRONMENTAL SCIENCES.
Structural Control of the Rapids and Pools of the Colorado River in the Grand Canyon,
W79-02200 2E

Relationships Among Substrate, Flow, and Benthic Microalgal Pigment Density in the Mechums River, Virginia,
W79-02229 5C

VOLCANI INST. OF AGRICULTURAL RESEARCH, BET-DAGAN (ISRAEL).
Transpiration Effects on Leaching Fractions,
W79-02019 3C

VYSKUMNY USTAV PAPIERU A CELULOZY BRATISLAVA (CZECHOSLOVAKIA). FORSCHUNGSINSTITUT FUER ZELLSTOFF UND PAPIER.
Possibility of Rendering Bleachery Effluents Harmless by Technological Changes (Ueber die Moeglichkeit Bleichereiabwaesser durch technologische Aenderungen unschaedlich zu machen),
W79-02360 5G

WAPORA, INC., CHARLESTON, IL. BIOASSAY LAB.
Considerations in Conducting Bioassays,
W79-02349 5A

WAPORA, INC., WASHINGTON, DC.
Survey of Environmental Regulations Applying to Geothermal Exploration, Development, and Use,
W79-02410 5G

WASHINGTON STATE UNIV., PULLMAN.
Optimization and Testing of Highway Materials to Mitigate Ice Adhesion,
W79-02408 8G

WASHINGTON UNIV., SEATTLE.
Implications of Alternative Measures of Natural Resource Scarcity,
W79-02049 6B

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Polychlorinated Biphenyls in Coastal Marine Zooplankton: Bioaccumulation by Equilibrium Partitioning,
W79-02242 5C

Blooms of Surf-Zone Diatoms Along the Coast of the Olympic Peninsula, Washington, IX. Factors Controlling the Seasonal Cycle of Nitrate in the Surf at Copalis Beach (1971 through 1975),
W79-02244 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF ZOOLOGY.
Specific Blue-Green Algal Carotenoids in Sediments of Esthwaite Water,
W79-02246 5C

WATER REUSE PROMOTION CENTER, TOKYO (JAPAN).
Desalination in the Reuse of Industrial Waste Water,
W79-02383 5D

WATERLOO UNIV. (ONTARIO). DEPT. OF BIOLOGY.
The Uptake of Dissolved Organic Matter by a Small Spring Stream,
W79-02248 5C

Particulate and Dissolved Organic Matter in a Small Partly Forested Ontario Stream,
W79-02252 5C

WATSON (J. D. AND D. M.), LONDON (ENGLAND).
Oxygen Transfer at Hydraulic Structures,
W79-02202 5G

WELL SURVEYS CO., HEREFORD, TX.
The Downhole TV Camera Can 'See' What's Wrong,
W79-02178 8G

WESTERN AUSTRALIA DEPT. OF AGRICULTURE, SOUTH PERTH.
Ammonium Effects on Nutrient Cation Absorption by Wheat,
W79-02021 3F

WINCHESTER CHEMICAL CO., FRANKLIN PARK, IL. (ASSIGNEE).
Method of Clarifying Industrial Waste Water,
W79-02312 5D

WINOUS POINT CLUB, PORT CLINTON, OHIO.
The Effect of Drawdown Date on Wetland Plant Succession,
W79-02424 2I

WISCONSIN UNIV.-MADISON.
Characterization and In-Plant Reduction of Wastewater from Hog Slaughtering Operations,
W79-02298 5D

WISCONSIN UNIV.-MADISON. DEPT. OF BACTERIOLOGY.
Kinetics of Algal Transient Phosphate Uptake and the Cell Quota Concept,
W79-02237 5C

Use of Fluorescence Microscopy for Quantifying Phytoplankton, Especially Filamentous Blue-Green Algae,
W79-02239 5C

WISCONSIN UNIV.-MADISON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
The Role of Silica and the Vernal Diatom Bloom in Controlling the Growth of Nuisance Algal Populations in Lakes,
W79-02152 5C

WISCONSIN UNIV.-MADISON. DEPT. OF ENTOMOLOGY.
Effect of Antimycin on Stream Insects in Field and Laboratory Trials,
W79-02156 5C

WISCONSIN UNIV.-MADISON. DEPT. OF SOIL SCIENCE.
Advection Modification of the Priestley and Taylor Evapotranspiration Formula,
W79-02395 2D

WISCONSIN UNIV.-MADISON. DEPT. OF SOILS.
Kinetics of Phosphate Uptake by Aquatic Microorganisms: Deviations from a Simple Michaelis-Menten Equation,
W79-02016 5C

WISCONSIN UNIV.-MADISON. WATER RESOURCES CENTER.
Increasing Efficiency of Aquatic Plant Management Through Processing,
W79-02158 4A

WYOMING UNIV., LARAMIE.
Telemetric Determination of Salmonid Winter Micro-Habitat Occupation and Movement in Ice-Covered Streams,
W79-02157 7B

WYOMING UNIV., LARAMIE. COLL. OF LAW.
The Idaho and Montana Procedures for Obtaining Water Use Permits--Possible Sources for Improvement of Wyoming Law, Comments,
W79-02082 6E

Changing Manner and Place of Use of Water Rights in Wyoming, Comments,
W79-02083 6E

Procedural Inconsistencies and Substantive Issues in the Federal Reserved Water Rights Doctrine. Case Note, United States v. Akin, 504 F.2d 115 (10th Cir. 1974),
W79-02084 6E

Land Use and Rights in Groundwater. Case Note, Alameda County Water District v. Niles Sand and Gravel Co., 37 Cal.App. 3d 924, 112 Cal.Rptr. 846 (Ct.App. 1974), cert. denied, U.S. 95 S.Ct. 128 (1974),
W79-02085 6E

WYOMING UNIV., LARAMIE. DEPT. OF AGRICULTURAL ENGINEERING.
Lawn Sprinkler Distribution Patterns,
W79-02155 3F

WYOMING UNIV., LARAMIE. DEPT. OF GEOLOGY.
Holocene Faulting in the Western Grand Canyon, Arizona,
W79-02496 2J

WYOMING UNIV., LARAMIE. WATER RESOURCES RESEARCH INST.
Evapotranspiration Estimates for Water Right Transfers,
W79-02491 2D

YALE UNIV., NEW HAVEN, CT. DEPT. OF GEOLOGY AND GEOPHYSICS.
Interstital Water Chemistry of Anoxic Long Island Sound Sediments. 2. Nutrient Regeneration and Phosphate Removal,
W79-02243 5C

YORK UNIV. (ENGLAND).
Pricing and Standards in the Control of Pollution,
W79-02057 5G

ACCESSION NUMBER INDEX

W79-02001	5C
W79-02002	5C
W79-02003	5A
W79-02004	5C
W79-02005	5C
W79-02006	5C
W79-02007	5C
W79-02008	5C
W79-02009	5C
W79-02010	5C
W79-02011	5C
W79-02012	5G
W79-02013	5C
W79-02014	5C
W79-02015	5A
W79-02016	5C
W79-02017	5C
W79-02018	5F
W79-02019	3C
W79-02020	5C
W79-02021	3F
W79-02022	3D
W79-02023	6C
W79-02024	6C
W79-02025	6A
W79-02026	6C
W79-02027	5G
W79-02028	6G
W79-02029	3C
W79-02030	5G
W79-02031	5G
W79-02032	6A
W79-02033	6B
W79-02034	6B
W79-02035	3F
W79-02036	6E
W79-02037	5D
W79-02038	5G
W79-02039	5G
W79-02040	6B
W79-02041	5G
W79-02042	6B
W79-02043	3F
W79-02044	5G
W79-02045	6C
W79-02046	6B
W79-02047	6E
W79-02048	6E
W79-02049	6B
W79-02050	6B
W79-02051	5G
W79-02052	6B
W79-02053	6B
W79-02054	6B
W79-02055	5C
W79-02056	6G
W79-02057	5G
W79-02058	6C
W79-02059	6B
W79-02060	6B
W79-02061	6B
W79-02062	6B
W79-02063	6C
W79-02064	6B
W79-02065	6B
W79-02066	6B
W79-02067	6B
W79-02068	6B
W79-02069	6B
W79-02070	6B
W79-02071	5G
W79-02072	6B
W79-02073	2F
W79-02074	2K
W79-02075	4B
W79-02076	1B
W79-02077	7B
W79-02078	5C
W79-02079	5A
W79-02080	5A
W79-02081	5G
W79-02082	6E
W79-02083	6E
W79-02084	6E
W79-02085	6E
W79-02086	5C
W79-02087	2L
W79-02088	3F
W79-02089	2L
W79-02090	3F
W79-02091	2H
W79-02092	3F
W79-02093	2L
W79-02094	3F
W79-02095	2H
W79-02096	5G
W79-02097	3F
W79-02098	2H
W79-02099	3F
W79-02100	2I
W79-02101	2I
W79-02102	5D
W79-02103	5C
W79-02104	2L
W79-02105	2H
W79-02106	6E
W79-02107	5G
W79-02108	2L
W79-02109	2I
W79-02110	2I
W79-02111	2L
W79-02112	6B
W79-02113	2L
W79-02114	2H
W79-02115	2H
W79-02116	2L
W79-02117	2L
W79-02118	2L
W79-02119	2E
W79-02120	2J
W79-02121	7C
W79-02122	2G
W79-02123	10D
W79-02124	2E
W79-02125	5B
W79-02126	2H
W79-02127	5B
W79-02128	2J
W79-02129	4A
W79-02130	2F
W79-02131	2K
W79-02132	2F
W79-02133	7C
W79-02134	2F
W79-02135	2J
W79-02136	7C
W79-02137	2E
W79-02138	7C
W79-02139	7C
W79-02140	7C
W79-02141	7C
W79-02142	5B
W79-02143	5A
W79-02144	5B
W79-02145	5A
W79-02146	5A
W79-02147	5G
W79-02148	5A
W79-02149	5A
W79-02150	5D
W79-02151	5B
W79-02152	5C
W79-02153	5B
W79-02154	2F
W79-02155	3F
W79-02156	5C
W79-02157	7B
W79-02158	4A
W79-02159	5D
W79-02160	2G
W79-02161	7C
W79-02162	2L
W79-02163	5G
W79-02164	5E
W79-02165	2L
W79-02166	5D
W79-02167	2J
W79-02168	6E
W79-02169	8B
W79-02170	5A
W79-02171	2F
W79-02172	4B
W79-02173	4B
W79-02174	6E
W79-02175	3D
W79-02176	4B
W79-02177	8G
W79-02178	8G
W79-02179	8G
W79-02180	8C
W79-02181	8C
W79-02182	4B
W79-02183	5G
W79-02184	5G
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W79-02498	5G
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W79-02500	5C

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W79-02019, 02021 02029, 02035 02043, 02088 02090, 02092 02094 02096--02097 02099, 02107 02122, 02199 02238, 02314 02320--02321 02359, 02362 02364--02366 02368, 02381 02395, 02406 02415, 02417 02436	31
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W79-02297--02302	6
Illinois State Water Survey, Hydrology	W79-02073--02075 02189--02197 02200--02220 02292	34
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W79-02296 02360--02361 02363, 02367 02369--02380 02382--02388	24
National Water Well Association, Water Well Construction Technology	W79-02168--02184	17
University of Arizona, Arid Land Water Resources	W79-02390--02394 02396--02399	9
University of North Carolina, Metropolitan Water Resources Planning and Management	W79-02303	1

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE (CONTINUED)		
University of Wisconsin, Eutrophication	W79-02001--02018 02020 02223--02237 02239--02252 02295	49
University of Wisconsin, Water Resources Economics	W79-02022--02028 02030--02034 02036--02042 02044--02072 02222	49
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W79-02076--02085 02151--02161 02166--02167 02186--02188 02293--02294 02355--02358 02400--02404 02446--02451 02489--02496	51
C. OTHER		
Army Engineer Waterways Experiment Station	W79-02344--02354	11
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W79-02452--02484 02486--02488 02497--02500	40
Forest Service (USDA)	W79-02431	1
Information Planning Associates, Inc.	W79-02142--02150 02405 02407--02413 02432--02435 02437--02445	30
National Oceanic and Atmospheric Administration	W79-02162--02165 02198, 02221	6

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER (CONTINUED)		
Ocean Engineering Information Service (Patents)	W79-02304--02313 02315--02319 02322--02343	37
Office of Water Research and Technology	W79-02185 02288--02291 02389	6
U. S. Geological Survey	W79-02119--02121 02123--02141 02253--02255	25
University of Massachusetts (Wetlands)	W79-02086--02087 02089, 02091 02093, 02095 02098 02100--02106 02108--02118 02256--02287 02414, 02416 02418--02430 02485	73

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ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL SOURCE
A. CENTERS OF COMPETENCE (CONTINUED)		
University of Wisconsin, Eutrophication	W79-02001--02018 W79-02303--02313 02315--02319 02322--02343	37
University of Wisconsin, Water Resources Center	W79-02185 02280--02281 02283	6
U. S. Geological Survey	W79-02119--02121 02123--02141 02253--02255	25
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W79-02076--02085 W79-02088--02091 02093, 02095 02098 02100--02106 02108--02119 02256--02282 02418, 02419 02418--02430 02485	73
C. OTHER		
Army Engineer Waterways Experiment Station	W79-02344--02354	11
Environmental Information of Pollutants on Aquatic Life)	W79-02452--02484 02486--02489 02497--02500	40
Forest Service (USDA)	W79-02431	1
Information Planning Associates, Inc.	W79-02142--02150 02405 02403--02413 02432--02435 02437--02445	20
National Oceanic and Atmospheric Administration	W79-02162--02165 02168, 02171	6